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EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

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VOL. XLI., No. 3. FRIDAY, JULY 20, 1906.

The field of electric traction on steam railroads is evidently soon to be widely extended in this country if the reported announcement of Mr. James J. Hill on his visit this week to the Pacific Coast is to be shortly carried out. This is to the effect that the Portland & Seattle, a Hill subsidiary, which is now building a line for the Great Northern and Northern Pacific down the Columbia river into Portland, is to build, true to its name, a new Hill link between Portland and Seattle, supplementing the present Northern Pacific line between those two cities, and that the new road or part of it is to be operated by electricity instead of by steam. This is the first instance in which one of the large railroad systems in the West has undertaken to install electric operation and the results of the experiment will be watched with a great deal of interest by railroad managers in that part of the country. The state of Washington appears to be a region unusually well suited to use of electricity as a motive power, because of its numerous water powers, many of them as yet undeveloped, which are easily available. As the new road has yet to be built, it will, of course, be some time before the final decision as to motive power need be made. By that time the experience gained by actual operation on some of the Eastern roads will be available. Nevertheless, the announcement of intention to electrify the new line is good proof that the success already obtained experimentally in electric operation by the New York Central, the New Haven and the Pennsylvania has made Mr. Hill, at least, reasonably certain of the success of the new system.

In its present somewhat inchoate stage the "Lincoln Republican" organization of New Hampshire, with which Winston Churchill is identified, apparently represents at least a sincere movement toward state reforms which may or may not hereafter be harvested in results on the variegated field of politics. The organization has lately struck a position on three points of railroad policy, namely, (1) opposition to free railroad transportation, (2) in favor of "true" valuation of railroad property for purposes of taxation, and (3) approval of the election of railroad commissions by the people. The first of these propositions we pass here until the limits of free transportation by the railroads—of course, inside the state—as contemplated by the new organization are more explicitly set forth, while as to "full" taxation of railroads, it may be suggested to the Lincoln Republicans of New Hampshire that taxation of a debt at par value and of stock at market value comes about as near fullness of valuation as can practically be attained in a country where there are about as many systems of railroad taxation as there are states in the Union. The third proposition, the election of railroad commissions by the people, is not only specific but pretty suggestive as coming from a New England State, and a commonwealth that has had a commission for many years, albeit with somewhat restricted powers; nor has it less meaning as an expression of a "reform" idea at a period when state commission activity in the land is reviving and, in too many cases, perniciously. But the plan is of very doubtful merit. Some states in the Union have now elective commissions, others appointive; but results show very obscure balances of virtue in favor of either system. As a very broad and general truism with many exceptions, it may be said that appointive commissions have shown themselves too lax, elective commissions too radical and both kinds ignorant and untrained, with liberal infusions of "politics," personal or partisan. The appointive state commission falls into the limbo of "pull" and favoritism, the elective commission into that of caucus and convention. Of the two, in the practical outworkings, the appointive plan is probably less bad, as it thrusts on the appointing power—whether governor, legislative or both—a certain personal responsibility. What the commissions need, of course, is what they now lack, men of character, courage and training. If men of intelligence, energy and civic righteousness, such as appear to be behind the new movement in New Hampshire, would only brace up the appointive system by bringing organized and intense pressure on the appointing power not only would the commissions be a good deal better than they are now, but almost as good as even idealists, under existing general conditions, have any right to expect. In the

absence of such civic energy the state commissions are as they are, with ability and equity alike predicated only upon the happy chance which now and then brings in an able and honest man as chairman.

THE OUTWORKINGS OF RAILROAD MONOPOLY.

In a railroad sense all New England, like the Gaul of Cæsar's Commentaries, divides itself into three parts. In the north is the Boston & Maine system, in the south, the New York, New Haven & Hartford system, and between the two the Boston & Albany line. The New Haven system in the south, ever since it acquired the New England some 10 years ago, may be described as an almost unqualified territorial monopoly more complete, probably, than can be found in any other similar region—of great wealth and industrial energy—in the world, except in those countries where the railroads are under State control. In the north the Boston & Maine may also be described as a monopoly, but a modified one. It has not the reach in territorial control of the New Haven nor the marine protection of a fleet of boats, nor the regulation, not to say check, of competition derived from large ownership of street railway systems. The fact that the Grand Trunk cuts both the northern and southern systems with outlets to Portland and New London respectively, is a coincidence which, while somewhat affecting western business, does not bear seriously on the dominance of the two great New England roads. The midway line, the Boston & Albany, is in no sense whatever a monopoly and, as a policy, has not acquired subsidiary or electric lines. To round up the description, it should be said that the New Haven had last year, including the Ontario & Western and Central New England lines, 2,833 miles of main track, and $49,981,948 gross earnings, not including earnings of the boat lines and street railways; the Boston & Maine, 2,286 miles of main track and $36,213,246 gross earnings from operation; and the Boston & Albany, 392 main track miles and $10,748,469 gross earnings from operation. The three corporations together operate over 96 per cent. of the railroad mileage and conduct about 98 per cent. of all the passenger and freight business covered by the reports of the Massachusetts railroad commissioners—ratios that would not be greatly reduced for all New England.

The three roads may therefore be said to represent the three principles of full monopoly, qualified monopoly and non-monopoly in a connected group of six States with a total population by the last census of 5,591,952, and with very high industrial development. What are the respective outworkings and by what can the results be tested? Primarily by the variations downward in freight and passenger rates during a period of years sufficient to index tendencies clearly. For this purpose we take the last 10 years, which is not merely a rounded span of time, but is sufficient to illustrate the principles stated—a period during which, in the history of the three roads, monopoly, qualified monopoly and non-monopoly have had their fullest play.

In the tables annexed, compiled from the annual returns of the Massachusetts Railroad Commission, are given the variations in rates per ton mile and passenger mile, the rates for the merged New England and Fitchburg lines being introduced for reasons to appear later.

Average Freight Rate per ton-mile (cts.).

Year.	New Haven.	Boston & Maine.	Boston & Albany.	New England.	Fitchburg.
1896..	1.57	1.53	0.94	1.11	0.86
1897..	1.54	1.45	.92	1.07	.87
1898..	1.51	1.48	.83	1.10	.82
1899..	1.41	1.43	.78	...	.77
1900..	1.45	1.44	.82	...	.80
1901..	1.48	1.13	.83	...	...
1902..	1.46	1.12	.97	...	...
1903..	1.41	1.13	.97	...	...
1904..	1.42	1.18	.99	...	...
1905..	1.41	1.15	.93	...	...

Average Passenger Fare per mile (cts.).

Year.	New Haven.	Boston & Maine.	Boston & Albany.	New England.	Fitchburg.
1896..	1.77	1.79	1.75	1.94	1.77
1897..	1.80	1.76	1.75	1.97	1.81
1898..	1.77	1.74	1.75	1.93	1.83
1899..	1.80	1.71	1.74	...	1.80
1900..	1.78	1.73	1.75	...	1.81
1901..	1.76	1.76	1.74	...	...
1902..	1.74	1.76	1.72	...	...
1903..	1.73	1.77	1.73	...	...
1904..	1.73	1.78	1.68	...	...
1905..	1.70	1.76	1.64	...	...

Taking up first for analysis the freight rate table, there will be noticed the absolute low rate through the decade of the Boston & Albany, due to its large through western business on low-class freight, and also the slight variation, if we compare the beginning with the end of the decade—the reduction being but a trifle more than 1 per cent. In comparing the New Haven with the Boston & Maine, certain qualifications must be stated. The sudden fall in the Boston & Maine rate from 1.44 cents to 1.13 cents in the year 1901 is explained by the absorption of the Fitchburg with its large low-class through freight traffic. If the difference be allowed for in the same terms, it raises the rate at the end of the decade to 1.46 cents while similar correction for the New Haven rate after taking in the low-class freight New England line raises the New Haven figure, for purposes of comparison, to 1.51 cents last year. In the final computation the reduction of the New Haven during the 10 years becomes, in percentages, a little more than 3.8 per cent.; of the Boston & Maine a little less than 4.6 per cent.; and of the Boston & Albany a little more than 1 per cent. as stated. Had the comparison been made for 11 years, the reduction on the New Haven would have been more than 9 per cent., as it had a rate of 1.66 cents in 1895. In the actual figures of the table since the merger of the returns of the New England and the Fitchburg, it will be noticed that the New Haven rate, as compared with the year 1901, has decreased 7 points, while the Boston & Maine has increased 2 points and the Boston & Albany 10 points.

In analyzing the passenger rate variations, as shown by the table, one is relatively free from the disturbance of the rates by the two absorbed roads. But the New Haven has just made a reduction to 2 cents a mile on its regular passenger fare which will be in force on its whole system by next November. On the basis of official information, founded on last year's passenger traffic, this will reduce the passenger fare average about 6 points to 1.64 cents. Crediting this reduction to the New Haven—and there is no evidence at hand that the Boston & Maine will meet it—the final computation shows a decrease for the New Haven of somewhat more than 7.3 per cent.; for the Boston & Albany of a little less than 6.3 per cent.; and for the Boston & Maine of nearly 1.7 per cent. Both the New Haven and the Boston & Maine seem to have "digested" the higher passenger rate on the New England and Fitchburg respectively without much change, each rising three points. In the reductions of the Boston & Albany a downward variation, due to meeting, in the large local business of its Boston suburban "loop," the competition of electric street railways must, presumptively, be allowed for; and reference may also be made to the fact that, on all three lines, there must be some difference from year to year in the volume of various classes of freight. But the latter are so averaged in a ten-year period that they are not likely to affect much the final conclusion.

In that conclusion we find—and the logic of the returns seems irresistible—that, as proved in practice by the New England experience, comprehending a large and populous territory and very extensive railroad operation, full monopoly, limited monopoly and non-monopoly stand in merit first, second and third respectively upon the scale of public benefit in so far as that public benefit is measured by public service and public concession. Reduced freight rates and reduced passenger fares are surely fundamental elements in what we may call the public function of railroads; and the New England case shows clearly that they are both on the side of monopoly. We might add, also, the more familiar fact that consolidation precedes monopoly and that, with consolidation, goes usually both better and cheaper operation of subsidiary and local lines. We cannot contend, however, that bettered public service exhausts the monopoly question. On the negative side will be cited an array of moral consideration. These will be urged with force and backed by example, the temptation to local abuses, to discriminations, to rebates and the sinister effects when monopoly focuses its powers on State legislatures. But even here may be raised, as partial offset, the question whether a State legislature—that of Connecticut for example, with its putrid reminiscences of the great parallel fight of 1889—is more corrupted by one railroad corporation than by the contention of two. And, finally, with the New England case still in the foreground, rises the telling fact that monopolies grow sensitive and responsive to the "monopoly" cry so insistent and so easily raised from the grievance, great or small, real or fictitious. By proverbial philosophy the monopoly, as a corporation, may not have a soul; but it owns a body and the body has nerves—and generally brains.

EXTRA-FARE TRAINS.

Our correspondent "Guelph," in another column, complains of the extra-fare trains on the New Haven road. In this particular case he will probably find a considerable number of travelers who will agree with him, and point out that on the approximately equal run from New York to Washington, where the service is competitive, there are no trains at all that charge more than the regular parlor car fare, while only one day train on each road—the Congressional Limited on the Pennsylvania and the Royal Limited on the Reading-Baltimore & Ohio route—fails to provide coaches as well as Pullman equipment. Yet the cost of a single-trip ticket from New York to Washington is $6.50, as against $5 from New York to Boston, and

the cost of a single-trip ride on the Congressional Limited, including the regular parlor car fare, is $7.75, as against $7 on the special fare trains of the New Haven.

Without stopping for further consideration of these two cases, except to mention that the New Haven road has been unable to maintain really fast schedules on account of the extensive rebuilding of its bridges, now nearly completed, it seems worth while to discuss the extra cost to a railroad of running fast trains as compared with slow ones. It is fair to say at the outset that this extra cost depends very greatly on whether the run is a long one or a short one. Great numbers of through trains between the twenty or thirty largest cities of the country run every day for short distances at the highest speeds, and the railroads evidently are glad to build the most powerful engines and use them to the utmost limit of their capacity in such services, but the congestion of general traffic caused by running a specially fast train may be said to increase almost in proportion to the distance. The delays to freight trains, clearing the track as they must twenty or thirty minutes before the limited is due, involves specific losses as well as other losses not easily defined. Besides this, the limited train must be made up of fewer cars than the ordinary train and must omit some of the intermediate stops in order to accomplish the journey in the shorter time allowed.

Without attempting the impossible feat of saying what the basis is upon which passenger as well as freight tariffs are made, it may be observed that one great difference between the two is that in the passenger service frequency of trains is an important element. Freight can be carried in train loads and the shipper is satisfied; passengers must be carried in half train loads or quarter train loads, or even smaller units, according to circumstances, thus doubling or quadrupling most of the items of expense, as compared with freight costs. The traffic officer who sets out to charge for passengers "what the traffic will bear" always finds many more reasons for reducing the rates and increasing the cost (increasing it by running more trains for the same number of passengers) than for increasing the rates. Low passenger rates do not pay anywhere except where people can be carried in large train loads. The western manager who said that he would like to abolish all his passenger trains and devote tne facilities of the road to freight spoke soberly, honestly and intelligently.

Railroads strive for additional passenger business even when the rates are not yielding their equitable shares of the profit necessary to recompense the stock and bondholders, because, as the passenger trains must be run to serve the people, whether the business is profitable or not, the income from additional passengers is almost all profit. That is to say, the second thousand of passengers produces a much larger proportion of profit than the first thousand. All these considerations apply in making rates for ordinary passenger service. Any fair investigator will admit that the great bulk of the passenger rates of the country are low enough now, if not too low, as compared with freight rates under the actual cost of service. Every instance of a rate which is kept up where it ought to be reduced the railroads could match with an instance of additional trains put on in advance of marked increases of traffic. When it comes to the justification of extra-fare trains, each such train, so far as we can recall, has been put on after it has been made clear from the parlor car traffic on ordinary trains that there would be a demand for the higher cost train from passengers whose time would be worth the additional money (one dollar an hour on the New York-Chicago and the Boston-New York trains). It must be clear from what has been said that the faster trains cost more to run than the slower ones. It might be said that all railroads run their passenger services as fast as they can conveniently and feel justified in charging an extra fare for a service so fast that it is inconvenient and expensive to them. For example, it would be hard for a fair-minded critic to decide off hand that the time between New York and Chicago should be made quicker than 28 hours, unless the hours saved could be shown to have a definite value. Running on the 28-hour basis (34½ miles an hour by the New York Central) the modern engine can haul enough cars to carry a paying load; and, allowing for the necessary stops and delays, the speed while in motion—say, 45 to 50 miles an hour—is certainly fast enough to obviate any annoyance from the feeling that time is being wasted. In these days there is no real difference in the accommodations of extra-fare trains and ordinary trains on through services. The extra sum charged is simply a bonus—and a very small one—paid by the passengers to induce the road to run a service that it could not otherwise afford to run. Looking at it in another way; owing to the limited capacity of a busy road to handle extra fast trains, it may be said that the additional fare tends to keep the travel on these trains low enough so that they can maintain their schedules, which they would doubtless have difficulty in doing if they were compelled to add car after car to handle the traffic which would otherwise go to the fastest train. Therefore, the extra fare not only protects the railroad to a greater or less extent from loss of money, but it protects the passenger on urgent business from loss of time.

Annual Report of the Suez Canal Company.

Although traffic through the Suez Canal was exceptionally active during the first part of 1905, for the whole year it showed a slight decrease from 1904, which was the climax of a series of years during which receipts had almost uniformly increased. The total receipts in 1905 were $53,461,640, a decrease of $373,640. Total expenses were $8,196,837, including $800,000 for sinking fund, and $50,000 for insurance. The net earnings were $15,264,802, a decrease of $362,783 from the previous year. During the year 4,116 vessels, with a total tonnage of 13,134,105 tons, passed through the canal, an increase of 121 ships and 267,730 tons, as compared with 1904, the decrease being all in merchant shipping. The average tonnage per ship showed no increase in 1904, but rose from 3,163 to 3,191 tons in 1905. Twenty years ago, in 1885, the average tonnage per ship was 1,748 tons, so that there has been an increase of about 80 per cent. in that period. Nevertheless, in spite of the increase in size of vessels, navigation has been made safer. In 1885 there were 43 groundings per 1,000 vessels using the canal, against only 17 groundings per 1,000 vessels in 1905.

Traffic on the canal was interrupted last year by an exceptional happening. On September 5 a fire broke out on the steamer "Chatham," which carried 80 tons of dynamite and 250 lbs. of detonators. The hold in which the fire was burning was flooded, but the bulkheads gave way and the ship sunk in a short time. Navigation was carefully carried on alongside the wreck by day, but it was finally decided that the only means of removing so formidable an obstacle was by blowing it up. After adopting all possible measures to lessen the damage the wreck was exploded on September 28. Work was immediately begun to repair the effects of the explosion, but was greatly impeded by pieces of iron which had to be removed in the dredging. On the four days between October 8 and October 11 109 ships, 53 from the north and 56 from the south had been delayed since the explosion passed through the canal.

The traffic of the year was increased by a further expansion of trade between the West and the East, and also in the early part of the year by shipments of coal for the fleets engaged in the Russian-Japanese war. The wheat traffic from India to Europe, an important element of the record travel of 1904, continued in the early part of 1905 to such a degree that the available tonnage was insufficient and ships had to be sent to India in ballast. This traffic decreased in the second half of the year and during the last quarter fell below the usual average.

Railroad Gross Earnings in May.

The gross earnings during the month of May show, as a whole, quite satisfactory increases over the figures for the same period of last year, the average increase of 49 roads being about 10 per cent. The two most important factors affecting earnings were the coal strikes and the large grain movement. The general business situation remained at the high level at which it has been during the last 12 months. Of the trunk line roads, nine report gross earnings of $38,783,300, an increase of $2,265,200, 6 per cent. This percentage is small in comparison with most of the other groups and is entirely due to the fact that three of the roads, the Pennsylvania, the New York Central and the Erie were badly hit by the strikes in Pennsylvania, which were not settled until late in the month. The coal and coke originating on the Pennsylvania Lines East amounted to 3,975,328 short tons, as compared with 4,207,011 last year. The other two companies under consideration doubtless suffered nearly as much as this. All other kinds of trunk line traffic were carried in large volume. The eastbound shipments of provisions from Chicago amounted to 156,126 tons, as compared with 129,285 tons during May, 1905. Shipments of packing house products from Chicago were almost double the amounts of last year and the eastbound trunk line movement of grain amounted to 11,675,000 bushels, an increase of nearly 6,000,000. Owing to this heavy grain movement the granger lines made an exceptionally good showing. The earnings of eight of them aggregated $17,533,307, an increase of $1,933,955, 12 per cent. Only one, the Chicago & Alton, shows a decrease, and this was due to the coal strike in the middle West. The effect of these labor troubles is clearly shown in the figures for the receipts of Illinois coal at Chicago; these amounted to but 109,379 tons, as compared with 280,257 tons the previous year. The other Chicago lines also suffered from this loss, but, having a greater diversity of traffic than the C. & A., their total earnings do not show it so plainly. Aggregate grain receipts at 15 interior markets were 47,370,293 bushels, an increase of over 13,000,000 bushels. Of the coal

roads, 11 earned $21,943,660, an increase of $267,290, 1 per cent. The only four companies which report increases are the Baltimore & Ohio, the Chesapeake & Ohio, the Norfolk & Western, and the Pittsburg & Lake Erie. The first three of these derive the greater part of their coal traffic from the West Virginia coal fields and their shipments of coal and coke show satisfactory increases, there having been no strikes in this region. The fourth road, the Pittsburg & Lake Erie, carried enough ore to offset its loss in coal traffic. As indicating the conditions affecting the other roads of this group, the anthracite coal shipments from eastern producing regions aggregated only 3,254,230 tons, as compared with 6,005,158 tons in May, 1905. The earnings of six roads in the southwestern group were $18,011,699, an increase of $1,829,948, 11 per cent. These roads profited largely by the big grain movement and by the increased live-stock shipments. In the southern group, nine roads report gross earnings of $18,775,361, an increase of $2,340,182, 14 per cent. The great industrial development of the south, which has been so noticeable during the whole past year, is responsible for this particularly satisfactory showing. The cotton movement was smaller than during May, 1905, when unusually heavy shipments were made. Some roads gained an increase in traffic from grain, the foreign shipments from New Orleans being 1,699,673 bushels, while in May, 1905, only 239,441 bushels were shipped. The transcontinental roads, as usual, show the greatest increase of any group. The earnings of three of them were $15,080,681, an increase of $2,972,997, 25 per cent. Much of this increase can be explained by the fact that each of these three companies operated during May of this year from 150 to 200 miles more track than they did in May, 1905. It is to be regretted that, owing to the loss of records in the San Francisco fire, neither the Union Pacific nor the Southern Pacific are yet able to make public their earnings for this month.

The accompanying table shows the gross earnings of 49 roads for May, 1906, and the increases over the figures for May, 1905:

Atchison, Topeka & Santa Fe	$6,782,266	$936,985
Atlantic Coast Line	2,250,905	228,802
Baltimore & Ohio	6,817,083	976,907
Buffalo, Rochester & Pittsburg	387,553	*381,895
Canadian Pacific	5,579,003	1,358,872
Central of Georgia	875,088	111,535
Central of New Jersey	1,736,264	*377,027
Chesapeake & Ohio	2,196,342	393,862
Chicago & Alton	822,121	*30,161
Chicago & North-Western	5,098,480	494,623
Chicago Great Western	688,057	108,572
Chicago, Milwaukee & St. Paul	4,340,243	439,689
Chicago, Rock Island & Pacific	3,926,801	428,427
Chic., St. Paul, Minneapolis & Omaha	954,687	65,714
Cin., New Orleans & Texas Pacific	758,022	114,672
Cleve., Cin., Chicago & St. Louis	1,989,663	230,888
Colorado & Southern	954,548	132,649
Denver & Rio Grande	1,702,482	255,122
Erie	4,102,435	*32,673
Grand Trunk	3,403,675	322,508
Great Northern	4,158,354	697,981
Hocking Valley	468,455	*58,031
Illinois Central	4,258,972	437,894
Interoceanic of Mexico	646,962	119,819
Kansas City Southern	765,652	162,792
Lake Shore & Michigan Southern	3,652,111	516,338
Lehigh Valley	2,418,335	*363,396
Louisville & Nashville	3,698,060	491,786
Mexican International	725,701	173,315
Michigan Central	2,099,087	229,236
Minn., St. Paul & Sault Ste. Marie	937,266	264,299
Missouri, Kansas & Texas	1,687,740	20,015
Missouri Pacific	3,703,000	326,000
Nashville, Chattanooga & St. Louis	995,199	139,772
National Railroad of Mexico	1,272,109	198,613
New York Central & Hudson River	7,250,241	112,739
New York, Ontario & Western	554,410	*115,224
New York, Susquehanna & Western	204,427	*41,236
Norfolk & Western	2,557,207	334,204
Northern Pacific	5,343,324	916,144
Pennsylvania Railroad Company	11,859,033	436,900
Philadelphia & Reading	3,289,052	*261,425
Pittsburg & Lake Erie	1,314,532	160,551
Pitts., Cin., Chic. & St. Louis	2,408,189	290,600
St. Louis & San Francisco	3,181,663	159,177
St. Louis Southwestern	767,831	94,868
Southern	4,434,651	583,679
Wabash	2,018,866	158,664
Yazoo & Mississippi Valley	736,633	137,174
Total	$132,772,780	$12,101,319

*Decrease.

NEW PUBLICATIONS.

American Street Railway Investments.—Issued monthly in connection with the *Street Railway Journal*. Edition of 1906. The McGraw Publishing Company, 114 Liberty Street, New York. 432 pages, and 49 maps. Price, $5.00.

The 13th annual edition of the "Red" Book is slightly larger than that of previous years, due partly to the addition of reports from new roads, partly to more complete statements from roads which were reported in the 1905 edition, and partly to the publication of a considerably greater number of maps of operating properties than have appeared in previous editions of the annual. The book starts with a compilation of street railway gross earnings arranged in groups of companies having gross receipts for 1905 of over $1,000,000; of between $1,000,000 and $500,000; of between $500,000 and $100,000; of between $100,000 and $50,000, and of between $50,000 and $25,000. There are now 51 companies in the first group, 39 in the second, 170 in the third, 100 in the fourth and 77 in the fifth. The five companies which had more than $10,000,000 gross earnings in 1905 are the New York City Railway Company, the Manhattan Railway Company, the Brooklyn Rapid Transit Company, the Philadelphia Rapid Transit Company, and the Boston Elevated, in the order named. It is interesting to note that the earnings of the New York City Railway Company were over $4,000,000 less in 1905 than in 1904 on account of the competition of the Subway. All the other companies show increases, although the increases in the case of the Philadelphia Rapid Transit Company and of the Boston Elevated were quite small. The Red Book is a very convenient street railway reference publication and the large maps constitute a valuable addition to it.

CONTRIBUTIONS

Failure of Electric Locomotives in the Simplon.

New York, July 13, 1906.

To the Editor of the Railroad Gazette:

On page 32 of your issue of July 13, 1906, you print a notice stating that the two electric locomotives which were borrowed from the Valtellina Railroad to haul trains through the Simplon tunnel have proved inadequate for the work and have been sent to the shops. This statement is distinctly misleading and, inasmuch as we represent in this country the "Ganz electric railway system," which has been successfully employed on the Valtellina road for many years, and which may be hurt through statements of this kind, we think it will be well to acquaint you with the actual facts.

You are probably aware that, when the Swiss Government decided to use electricity as motive power for the Simplon tunnel, it provided for five electric locomotives. Three of these were loaned by the Italian State Railways. These three were built by Ganz & Co., and have been in operation on the Valtellina Railroad. The other two locomotives were built by Brown, Boveri & Co. on an order received originally from the Adriatic Railroad for operation on the Valtellina Railroad. This order was, however, canceled later on, due principally to late delivery, and the locomotives were placed at the disposal of Brown, Boveri & Co., who then proposed to use them for the working of the Simplon tunnel. The electric operation in the Simplon tunnel was to commence on June 1, 1906. From that day on, the three electric locomotives built by Ganz & Co. have been continuously in service without any trouble and they are conveying eight trains per day through the tunnel. The two locomotives supplied by Brown, Boveri & Co., however, became unfit for the service on the first day of operation, as the motors broke down and the locomotives had to be sent to the repair shops. For that reason there are not sufficient locomotives available now to work the traffic exclusively by electricity, and some of the trains will be conveyed by steam locomotives until the two locomotives built by Brown, Boveri & Co. can be repaired and made fit for service again.

We trust that you will be good enough to publish this explanation, and in view of the great difference in behavior of the two types of locomotives it might be interesting to your readers to know that the motors of the Ganz system have their electrical windings hermetically sealed in metal tubes, protecting them not alone against dust and similar substances, but also against moisture and even directly against water. That this protection is most effective seems to be clearly shown by the experience of these locomotives under the trying conditions of the Simplon tunnel. As a matter of fact, the Ganz three-phase electric locomotives are probably the most robust electric locomotives ever built.

G. Leve,
Second Vice-President, Railway Electric Power Co.

Recent Development of American Passenger Locomotives.

New York, June 16, 1906.

To the Editor of the Railroad Gazette:

In the interest of historical accuracy, as well as in justice to a locomotive builder now no longer with us, but who did much good work in the early days, I call attention to an error of statement in the article on "Recent Development of American Passenger Locomotives," appearing on page 641 of your issue of June 15th. It is there stated that:

"When designs had apparently reached their limits, a *revolution was created* by the introduction of the class K locomotive upon the Pennsylvania Railroad by Mr. Theodore N. Ely, who was at that time superintendent of motive power. *He simply raised the boiler and placed the mud ring on top of the frames, above the driving axles*, by which he was enabled to add about 7 in. to the width of the grates, while the length was limited only by the ability of the fireman to properly distribute the coal." (Italics mine.)

To the same effect, it is also stated that "As in 1881, Mr. Ely solved the problem of the narrow firebox by putting a wide one on top of the frames," etc.

Dr. Thomas P. Jones, who, many years ago, was Superintendent

of the United States Patent Office, said, among other good things, in criticizing alleged new inventions, that the Patent Office records showed us the reprehensible practice of our ancestors in pirating our inventions. As a matter of fact, Mr. Ely's "revolution" and solution of "the problem of the narrow firebox" were pirated, about 24 years before he made them, by James Milholland, Master Mechanic of the Philadelphia & Reading Railroad, who, in 1857, "simply raised the boiler and placed the mud ring on top of the frames, above the "driving axles," in the engine "Vera Cruz," and continued that practice, in both passenger and freight locomotives, for many years thereafter.

The "Vera Cruz" had 24.5 sq. ft. of grate area, which was very large at that date, and, in a 15-in. cylinder engine, is more than proportional to the 35 sq. ft. of Mr. Ely's engine. An illustration and description of a Milholland engine of the "Vera Cruz" type, showing sections of the boiler and firebox, was published in the London *Engineer* in 1860, and the same matter will be found in other publications. Whatever credit is due to placing the firebox above the frames, in the manner stated in your article, should be awarded to James Milholland. J. SNOWDEN BELL.

It is quite true that Mr. Milholland put the mud ring of his firebox on the top of the frame many years before the appearance of the Pennsylvania class K. But the credit for the innovation, as it certainly was, in 1881, lies in the fact that the designer had the courage of his convictions and dared to raise the center of gravity of his boiler to a height that Mr. Milholland did not dream of but which the growth of the engine during the preceding years necessitated if the design were to be used. As a matter of fact, the predictions that the engine (class K) would upset were so emphatic that though the calculations had been carefully made and these showed complete stability at 60 miles an hour on the track between Altoona and Harrisburg, the speed on the first run down was limited to 40 miles an hour. On this trial the engine was so steady that on the return trip all scruples were cast aside, and 60 miles an hour maintained, thus demonstrating the stability of the machine and showing that the method of widening the firebox was practicable for existing conditions. By this, as I stated in the article referred to, the introduction of the widening of the firebox was brought about, and not that the mud ring had never been placed on the top of the frame before. GEO. L. FOWLER.

Extra-Fare Trains on the New Haven.

New York, July 16, 1906.

TO THE EDITOR OF THE RAILROAD GAZETTE:

It is the claim of the advocates of railroad territorial monopoly —notably, President Mellen, of the New York, New Haven & Hartford—that complete occupation of a given region by one railroad company results in better service for less money than would be possible with competing roads bidding against each other for the business. Concretely, it is urged, and not without considerable justice, that the southern part of New England is better served by the New Haven road than it would be by two or more competing lines. Many things go to prove this true in the New Haven's case, but there is one feature of its passenger service in which it is safe to say that, for the average traveler, competition would result in a great improvement in service. The New Haven has a monopoly of passenger travel between the cities of New York and Boston, which are 232 miles apart by the usual (Shore Line) route. The travel between them is regularly very heavy; so much so that with the adoption of this year's summer time-table a new five-hour train (the Mayflower Limited) has been put on, running from each terminal daily over this route. This makes the fourth five-hour train in regular service in each direction. On all of these trains an extra fare of $2 is charged between any two points, raising the fare between New York and Boston from $5 to $7, or between New York and New Haven from $1.50 to $3.50. There are nine through trains over the Shore Line between New York and Boston, and the fastest time made by any one of the other five is, with one exception of five hours and a half, six hours less one or two minutes for the 232 miles. As a result of the system of excess fares, the only way in which one can make a trip between the two cities in five hours, which is at the rate of 46.4 miles an hour—not remarkably fast time—or in correspondingly fast time to New Haven, New London or Providence, is to pay what amounts to an increase of 40 per cent. over the regular fare for the through run and of 133⅓ per cent. between New York and New Haven. For the average traveler this is a hardship. He is not surprised that an extra fare is charged on one particularly fast train of a road, like the 18-hour New York-Chicago specials of the Pennsylvania and New York Central, connecting long distance points, but when on every train which makes a 230-mile run in five hours an extra fare is charged, it seems a discrimination. It may be objected to this view that the $2 extra charge is only double the regular parlor car fare, and that, therefore, it really only slightly increases the regular rate. In practice, however, to all those who for a five-hour trip would not use a parlor car it raises the railroad fare by the full amount, since no coaches are run on these trains. If the two cities were far enough apart so that the trip involved a night on the road there would be some argument for such a system, for then most travelers would pay for extra accommodations in any case, but here the extra charge is in many cases simply a tribute to the absolute monopoly of the railroad company. Modern competition for passenger traffic shows itself mainly in an attempt to attract travel by satisfactory service, and there is no doubt but that if there were competition between New York and Providence or Boston it would be possible to travel on most, if not all, of the faster trains by payment of the regular fare. Viewed from the railroad's standpoint, and particularly in the case of a road like the New Haven which runs its own parlor cars, the financial results of the present system are, of course, highly satisfactory; but from the standpoint of the general public, to have an excess fare charged on all the fast trains between New York and Boston is not calculated to make clear the advantages of a pure territorial monopoly. GUELPH.

New Electric Lines of the Great Western Railway and the Hammersmith & City.

The most recent instance of railroad electrification in England is that now being completed on the Hammersmith & City line and the Great Western additional lines between Bishop's road and Westbourne Park, together with a branch from Latimer road to Uxbridge road. From Uxbridge road to Addison road trains run over the West London line, and in consequence a part of this has had to be electrified together with the two bays at Addison Road station.

Electrical energy is obtained from the Great Western's new generating station at Park Royal. This station generates a three-phase current at 6,300 to 6,600 volts, which is transmitted over underground feeders to Old Oak Common, where the first substation is, at the junction between the High Wycombe line and the Great Western main line. From this point the feeders are carried by the side of the main line to Westbourne Park, where they branch, four going to a substation on the south side of the main line at Royal Oak and three to a substation on the west side of the Hammersmith & City line near Shepherd's Bush. From Park Royal to Old Oak Common is about 1 mile, to Royal Oak 4½ miles, and to Shepherd's Bush 5 miles. The current is stepped down to 630 volts direct current for distribution to the conductor rails of the Hammersmith & City and for lighting purposes in the locomotive sheds, carriage sheds, freight yards and offices, and part of Paddington station. Alternating current at either 220 or 110 volts is used for arc and incandescent lighting and for small motor work throughout the Great Western stations, freight yards, offices and hotel, at or near Paddington. The present power station is of 6,000 k.w. capacity in 750 k.w. sets, but this is one-sixth of its planned ultimate capacity.

As the Hammersmith & City trains run over the Metropolitan Company's lines from Bishop's road by the Inner Circle to Aldgate, the system adopted had to be the same as that already in use on the Metropolitan and Metropolitan & District Railroads. There are two insulated conductor rails, the positions of which correspond exactly with those on the Metropolitan & District Railway, the positive conductor being 3 in. above the rail level and 16 in. outside the running rail, and the negative 1½ in. above rail level, and in the center of the track. The two conductor rails are of an inverted channel section resting on iron-capped porcelain insulators. The insulator is fixed to the sleeper by small clamps and coach screws. This design leaves the conductor rail and insulator free to move up and down relatively to each other, as occurs when a train is passing, owing to the spring in the sleepers and roadbed. The rails are 102.8 lb. and have a cross-sectional area of approximately 10 sq. in. They are made of steel having a conductivity equal to 15 per cent. of that of copper. The rails are fished by a joint-plate on the under side and are connected by four laminated copper strip bonds, which are protected by the joint-plate. Long steel ramps made from a bent section of the ordinary conductor rail are used at all facing ends and short cast iron ramps at trailing ends. At points and crossings the different lengths of conductor rail are connected by rubber-insulated and lead-sheathed armored cables buried direct in the ground, each end of the cable being sealed in a specially designed porcelain terminal cap, from which a solid copper rod projects. To this projection two flexible copper bonds are clamped, the other ends of the bonds being expanded into the conductor rail. Any jumper cable can thus be at once disconnected by removal of two bolts in the clamp. The feeder cables are connected to the rails in the same way. The conductor rails are divided into sections corresponding approximately to the distance between stations. A sectional insulator is placed just beyond the cross-over at each station, so that in the event of a breakdown at any point it will always be possible to continue working the trains up to the next station by using the cross-over there for shunting the trains from one line to the other. Under normal conditions all sections will be connected,

the gap at the section insulators being bridged by switches which will be kept closed. The line is fed from the substations at Shepherd's Bush and Royal Oak, eight feeders being carried from the former and four from the latter.

At Hammersmith large new train sheds have been built to house 20 new electric trains. The ordinary conductor rails are stopped 15 feet away from the shed doors, so as to leave a clear gangway outside the sheds. Inside the sheds the trains will be supplied with current from overhead. A steel joist carrying a small trolley is supported from the roof above each line from end to end of the carriage shed. The trolley is fitted with two collectors, which take current from two insulated trolley wires placed one on each side of the steel joist. A flexible cable from the trolley can be plugged on a socket in the train.

Each of the trains consists of two motor cars and four trailers with an aggregate seating capacity of 320 persons. They are similar to the Metropolitan cars with closed vestibules, and are being built by the Metropolitan Amalgamated Carriage Co. at Saltley. Each motor car has four 150 h.p. motors, two on each bogie; they are designed for a schedule speed of 16 miles an hour, including stops, and for a maximum speed of 30 miles an hour. The British Thomson-Houston Co. has supplied the whole of the electrical equipment. Multiple unit control is used. All connecting leads are run in metal pipes, and special fire prevention precautions have been adopted. The trains are fitted with the Westinghouse air brakes. The rolling stock was designed by Mr. G. J. Churchward, Locomotive Superintendent of the Great Western, and Mr. Alfred Ingram, Carriage and Wagon Superintendent of the Metropolitan.

Testing and Inspection of Railroad Supplies.*

The main object of the Test Department is to determine the kind and quality of material most efficient and economical for any given purpose, and then by means of routine tests to hold shipments fully up to the desired standard. The plan usually followed is to get together all the information obtainable regarding the particular article to be investigated, decide through study of service tests just what properties are essential to the greatest efficiency, and then work out specifications which will enable the manufacturer to understand thoroughly just what kind of material is desired and what tests must be met to insure acceptance of shipments.

These proposed specifications are referred by the Purchasing Agent to the manufacturers for their criticism, the replies are sent to the chemist, and a final draft is then prepared with any changes necessary, submitted again if needful to the manufacturers and finally to the First Vice-President for approval.

Orders are then placed in accordance with the new standard, and on receipt of each shipment a sample is selected at random and forwarded for test. If the sample is not in accordance with the specifications the shipment is rejected, and the freight is paid by the shipper. In this manner inferior material is weeded out from the good and discarded.

Iron in one form or another is, of course, an important item of railroad supplies. Bar iron, and the better grades for bolts and for staybolts come under this head, and also rivets, steam pipes, boiler flues, chain, iron castings, wheels, etc.

The quality is determined in part with the so-called "test machine," by which the tenacity and ductility of the metal are measured; the cold bending test develops any cold-shortness, if present, and the hot bend any red-shortness or failure to bend when red-hot. If too much sulphur is present the iron will crack on bending hot, while excess of phosphorus will cause cold-shortness. More than a trace of copper will prevent proper welding—and too little working in the rolls, or finishing at too high a temperature will result in brittleness, and be indicated by the bright granular condition of the fractured surfaces, instead of the long, ropy fibrous apearance indicative of toughness and strength.

The pig iron used for making cylinders and other castings must be low in phosphorus or the metal will be weak and brittle—not too high in manganese and sulphur or it cannot be machined—and close-grained and compact to insure strength and impermeability. Analyses are made of samples from each carload of pig iron to hold it to the proper quality, and the foundry practice has been carefully studied, and treatment is applied to render the iron tough, strong and ductile.

Tests of cast-iron wheels for freight cars are made at the place of manufacture and involve measurements and weight and general inspection, and a "drop test" made by allowing a weight of 140 lbs. to fall upon the wheel from a height of 12 ft. a specified number of times, depending upon the weight and size of the wheel—12 blows for the usual 33-in. wheel.

Materials of steel are of great importance, since they include such products as boiler steel, axles, rails, splice plates, springs, piston rods, crank pins, castings, general forgings, building material, etc. In fact, the very stability of the structures, the engines and equipment depends in large degree upon the quality of the steel and iron. In the case of boiler steel, a test piece is taken from every sheet and given a tensile test to insure the desired strength and ductility, freedom from flaws, etc.; a bending test is made after quenching, to avoid possibility of brittleness, and also chemical analysis to determine and bar out more than a certain proportion of phosphorus and sulphur.

Steel rails, splice plates, axles, piston rods, crank pins and springs are inspected at the manufacturing plant. Each spring is pressed down solid in a testing machine, and must also have a certain height under a given load, be of correct design, etc. Also an analysis is made of one spring of every 200 to determine whether the steel may be depended upon to give good service.

Axles in addition to the usual surface inspection and measurement are subjected to a drop test to insure freedom from brittleness, and they are also held to a definite composition to enable them to support the loads and give reliable service. Rails likewise have composition specified to secure proper hardness and toughness, and a drop test is made upon a rail-butt from each heat from the top of an ingot, allowing a 2,000-lb. weight to fall a distance of 20 ft., striking the rail midway between two supports 4 ft. apart. If the steel is brittle and unsafe for use, owing to defective manufacture, pipes, flaws, etc., this 40,000 foot-pound blow speedily renders the fact evident and breaks the rail, sometimes into splinters. In some cases, especially when steel has given poor service, it is necessary to make a microscopic investigation of the structure of the metal to find out the exact conditions of heat-treatment received in course of manufacture, for as is well known, good steel can be completely ruined by incorrect heat-treatment. If the steel was overheated or burned, and thus was rendered brittle and untrustworthy, the fact is clearly shown by the microscopic structure.

Passing now from iron and steel, we may mention protective coatings for metal or wood. Paints to-day are used in enormous quantity, and it is of great importance to obtain the utmost durability not merely in order to afford the necessary protection and appearance, but also to reduce labor costs and to avoid the need of frequent shopping of equipment and consequent withdrawal from urgent service. The paints are separated into their constituents and the purity or efficiency of each is determined. The linseed oil must not be of poor quality or adulterated with fish oil, mineral oil, corn oil, etc.; turpentine must be really turpentine and not benzine; and japan must be up to the specified strength and quality.

"Hot boxes" are generally due to difficulty with oil, wool-waste or bearings, and each of these materials are held to a definite standard. A week often passes without a single hot-box upon any of the passenger equipment of the Reading.

Wool-waste for freight service must contain at least 65 per cent. of pure wool and be of fair length of thread, or the waste after short service would lose its elasticity and fail to remain in contact with the journal, thus cutting off the feeding of the oil to the axle.

The oil must have correct flashing and burning points, be of proper viscosity and have enough fat oil to make the mixture adhere to the steel. Signal oil must be of standard composition and quality so that the wick in the lamp will hold the flame in a gale of wind; headlight oil must not explode even when hot and jolted.

Also each kind of machinery must be lubricated with oil adapted to its weight and speed—or loss of power, heating or rapid wear will result, with heavy bills for maintenance or repairs.

Air-brake hose must stand a pressure of 400 lbs. per sq. in., and the rubber must be tested to prove whether or not it is so adulterated with shoddy, mineral matter, paraffine, tar, etc., that its life will be gone and it will be useless within a few months. The battery materials to operate the electric track signals with which our tracks are protected must be found so free from impurities that the service rendered will be absolutely reliable.

Portland cement is very largely used in construction work, and gives excellent results when the quality is good. It may, however, be unsound and cause the work gradually to disintegrate, or it may be shipped out by the manufacturer while it is too fresh—not properly aërated—and if used then the concrete would not prove lasting but would crack and weaken; in these cases careful tests indicate the quality, and they often keep from service material which would have caused failure and perhaps accident.

The water supplies, both for steam and for drinking purposes, also require careful attention. The former must be of a character that will not corrode the boiler, nor on the other hand fill it with scale and necessitate frequent cleaning of the flues, and waste of fuel, since scale ⅛ in. thick means a loss of fuel of 22 per cent.; also, the character of the water must be so regulated when necessary by treatment, that foaming and liabilty of explosion will not be possible.

Every water supply upon the Reading is tested from time to time; bad waters have been abandoned, and other supplies substituted, or, if nothing better is available, treatment is applied to neutralize the injurious results which otherwise would follow.

Every water used as a drinking supply in stations or upon cars has also been carefully analyzed to be certain that it is as free as possible from contamination.

*Paper read before the Franklin Institute by Robert Job, Chemist of the Philadelphia & Reading Railway Company.

Whenever desirable, bacteriological examinations are made to determine whether a water supply in some locality may have become contaminated and caused typhoid fever or other disease which developed.

Tin plate and roofing tin sometimes have so thin a coating of tin or composition that rusting begins after exposure of a day or two upon a roof, and we have actually received shipments in which the thickness of the tin coating averaged less than 3/100,000 of an inch. Such material of course has little practical value other than that of the steel sheets of which it is composed, and the latter could be secured at far less cost than probably would be charged for the so-called "tin plate."

Insulated signal wire is tested to determine whether the copper is pure, and the rubber and other insulation of standard quality.

Soap must be free from excess of alkali, salt and other impurities, and must not be adulterated with clay or other "fillers," and must not contain more than a definite proportion of water.

Enough instances have now been cited to convey some idea of the great variety of tests and inspections regularly made by the Test Department. In addition to such routine work, investigations are made upon materials which may have given unsatisfactory service, or which apparently have not been exactly adapted to the conditions under which they were used, in order to determine just why the failure occurred, or the service was defective, and the data thus obtained often results in revision of specifications with consequent improvement.

Investigations are also made to devise new methods for use or renewal of waste materials or to develop new processes, large savings having been effected through such work.

The preservation of wood is a subject of the greatest importance to every railroad, and a very careful investigation has been made of all processes used and results obtained both in this country and abroad; also tree-planting upon the land at our disposal has been looked into thoroughly and estimates obtained as to the cost and ultimate return from such investment under our conditions of place and climate.

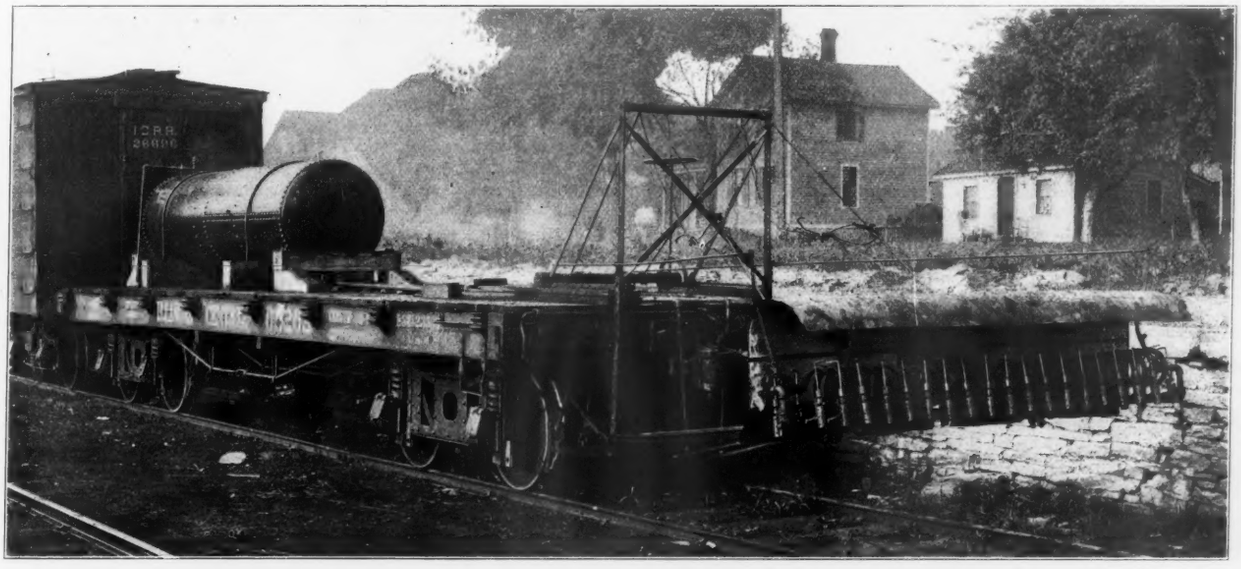
From the foregoing brief account of work of the Test Department, the fact will, I think, be evident that a persistent and earnest effort is being made to secure the grades of material best adapted to the various purposes, and such effort naturally results in relatively great durability of material, and thus in great ultimate economy combined with a high degree of safety and of efficiency in the service.

The authorities of the Congo Free State report to the King of Belgium that steamers are now running on all the navigable streams in the country, which must amount to several thousand miles, chiefly the Congo and its numerous tributaries. On the middle section of the main stream, between Stanley Pool and Stanley Falls, there is a regular service three times a month, and the boats make the round trip in 45 days. Six steamers are employed on this line, three of them of 150 tons burden and with accommodations for 30 passengers each. Work is in progress to open the upper river to navigation. Little steamers of five to 30 tons are now employed. A railroad is to connect the upper Congo with the interior lakes. About 80 miles of track is laid from Stanleyville up the Congo to Ponthierville, where the river again becomes navigable for a stretch of 275 miles to Sendwe. Above Sendwe there is another stretch of unnavigable river to Buli, which is to be covered by a railroad; above Buli steamers can go 400 miles further up to Kalengwe, 10 deg. south of the equator, and near the southern border of the Congo state, where there is said to be copper. This is perhaps 400 miles north by west of the present terminus of the Cape to Cairo Railroad. The numerous transfers which this route will require would make transportation too costly for ordinary freights; but the exported produce of the interior of the Congo state consists largely of rubber and ivory, which can bear enormous charges.

The Lamb Gasolene Weed Burner.

The accompanying view is of a gasolene weed burner which has recently been on trial on the Illinois Central Railroad. Nine miles of track between Buckingham and Clark City were gone over with the burner and a subsequent inspection showed that all weeds had been killed outright, leaving nothing standing but burnt stalks and stubble. This latter can be completely consumed by a second trip of the burner, when desired, or left to be carried away by the wind and the drafts of passing trains. The actual cost of the work was said to be less than $50, while the same work done by section hands would, of course, be many times this.

The burner is simple in design and can be worked by one man. It consists of the series of generating coils plainly visible in the view, into which the gasolene is forced by air pressure from the 1,000-gal. tank at the opposite end of the car. To the front and rear of the coils are a row of Bunsen burners, which give a strong, continuous flame capable of being increased or decreased at will. The burners are set on a bar which works on pivots at each end and can therefore be quickly raised or lowered as desired.



The Lamb Gasolene Weed Burner.

The burner is the device of Mr. W. W. Lamb, Chicago, who has been engaged several years in perfecting it. He claims that under suitable operating conditions the cost of killing weeds with this machine need not exceed $3 to $4 a mile, and that the tracks can be cleaned by a second trip at an additional cost of $2 a mile. The speed on the recent trial was 3 m.p.h., but Mr. Lamb claims that by increasing the size of the generator, and the generating power correspondingly, almost any speed within reasonable limits is possible.

The burner is of equal, if not greater, interest to interurban roads; for apart from its weed burning possibilities, the patents on the machine apply to the melting of snow and ice on railroads and highways, and a machine is now being built which the patentee expects will alter present methods of cleaning snow off of city streets. Mr. Lamb's address is 1414 Manhattan Building, Chicago.

Power Signaling in England and Scotland.

From a summary printed in *Engineering* (London), June 22, it appears that there are now in use on British railroads 115 plants, in which signals or switches, or both, are worked by electric or pneumatic power, and it is only a little over six years since the first power plant was installed in Great Britain (the electro-pneumatic at Bethnal Green on the Great Eastern). Power apparatus is now used at half a dozen large stations—Euston, Hull, St. Enoch's

(Glasgow), Crewe (freight), Bolton and Folkestone. Power plants are to be used at Clapham Junction and Newcastle-on-Tyne, and it has been decided to use power at Glasgow Central, Victoria (London, Brighton & South Coast) and elsewhere. The Westinghouse electro-pneumatic is in use at Bolton, on the Lancashire & Yorkshire; Tyne Dock and Hull on the North Eastern, and throughout the lines of the London District Railway. It is to be used at Newcastle. The low-pressure pneumatic is in use on the London & South Western at Grateley, Salisbury, Staines, Basingstoke and other points and 14 at cabins on the Great Central between Manchester and Newton. Webb & Thompson, all electric, has been in use at Crewe freight yards several years and for one year at four cabins at Euston, and near York on the North Eastern. The Siemens all-electric system is in use on the Midland at Derby and at Didcot on the Great Western. The Sykes system is in use at St. Enoch's, Glasgow; at Folkesstone, and on other places on the South Eastern & Chatham, and at Victoria Station, London. In the Sykes system electric power is used for the signals, but manual power for switches.

Automatic block signals are in use in England on the North Eastern between Alne and Thirsk, 11 miles; on the London & South Western between Grateley and Andover, six miles, and between Woking and Basingstoke, 23 miles; on the London District Railway throughout its lines and on the Great Northern & City. A few automatic signals are in use on the Lancashire & Yorkshire near Middleton Junction, and on the Great Central near Ashby Magna.

The New Cunarders.*

The launch of the "Lusitania" at Clydebank recalls attention to the characteristic features of the two great Cunard steamships which are being built under special agreement with the British Government. The fundamental condition of that agreement is that these vessels shall be "capable of maintaining a minimum average ocean speed of from 24 to 25 knots in moderate weather." The fulfilment of this condition will restore to the British flag the supremacy in speed on the transatlantic service which was long maintained, but which passed to the Germans nine years ago. The "Campania" and "Lucania" (built in 1892-93) still remain the fastest British steamships; they are propelled by twin-screw engines of 30,000 h.p., and have attained 22 knots. The North German Lloyd steamship "Kaiser Wilhelm II" began her service in 1903 and has a speed of 23½ knots; horse-power 40,000. Increase in speed from 22 to 23½ knots involved about 30 per cent. increase in displacement and horse-power; the water-line length was increased by 86 ft. and the cost by 50 per cent.

To endow the new Cunarders with as great a superiority in speed over the German steamship as she possessed over the "Lucania" was a formidable undertaking. The laws of steamship propulsion are well understood, and to increase speed across the Atlantic from 23½ to 25 knots involved much greater proportionate increase in engine power, coal consumption and dimensions than that involved in passing from 22 to 23½ knots. Precedents had to be surpassed and many difficult problems solved.

It soon became obvious that the engine power required must be from 60 to 70 per cent. greater than that of the "Kaiser Wilhelm II," and the coal consumption proportionately increased. The installation of this immense power and of the corresponding coal supply was no easy matter. In round figures 1,000 tons of coal will have to be put into the furnaces in every 24 hours during the transatlantic passage.

The choice of the most suitable propelling apparatus involved considerations of alternative types of machinery. If reciprocating engines had been adopted, triple-screws and three sets of machinery would have been necessary. Each set of engines would have been of greater power than a set of engines in the "Kaiser Wilhelm II." It would have been necessary to place one set abaft the other two; consequently engines of enormous power and with great weights in the moving parts would have been installed far aft, and there would have been risks of objectional vibration, even when all possible precautions had been taken to balance moving parts of the engines. Furthermore, the manufacture of the screw shafting, and particularly that of the crank-shafts, would have involved great difficulties, as the sizes required would have been far beyond precedent. The directors of the Cunard company, therefore, appointed a special committee for the purpose of considering and reporting on the possible adoption of turbine machinery. Certain advantages of turbines had already been demonstrated, chiefly by experience with installations on land, but partly with turbines fitted in cross-channel steamers and torpedo craft. Freedom from vibration, reduced cost of maintenance and working expenses, greater economy in the use of steam at or near maximum power, capacity to run continuously for long periods without sensible deterioration in condition and power to take considerable overloads without injury were among the proved qualities of turbines; evidence was available also to show that turbines increased their economy with increase in size and power. All these features were substantiated by independent investigation.

At that time the cruiser "Amethyst" had not completed her trials, but she represented the greatest horse-power applied to marine turbines—her three turbines being estimated to develop from 12,000 to 14,000 horse-power. The Allan line had decided to use turbines in two new transatlantic steamers of large size, but the power was not greater than that of the "Amethyst," and the work of construction was in an early stage. An enormous advance, therefore, had to be made if turbines of nearly five times the power were to be installed in the new ships. Indeed, the step forward in power was practically as great as the total advance made gradually with reciprocating engines in from 40 to 50 years. This change in propelling apparatus has since been emphasized by the adoption of turbine machinery in all vessels recently ordered for the royal navy, from the great battleship "Dreadnought" down to the "coastal destroyers." The Cunard company decided also to fit turbines to the "Carmania" and compare her performances with those of the sister ship "Caronia," which is fitted with reciprocating engines. Instead of the triple-shaft arrangement of turbine machinery which had been adopted in most steamers, the "Lusitania" and "Mauritania" will have four propelling turbines, each working a separate shaft and propeller, and two reversing turbines will be fitted on the shafts nearest to the middle line of the vessels. In this way the sizes of the turbines will be kept down and the total power will be distributed; but even under these conditions the moderate rate of revolution adopted results in very large dimensions of the turbines and their castings.

Before the dimensions and forms of the vessels were definitely determined extensive experiments were made with models tested in the admiralty tank at Haslar, and great advantage resulted from this investigation. The dimensions finally adopted are as follows: Length over all, 790 ft.; length at water-line, 760 ft.; breadth, extreme, 88 ft.; depth, 60½ ft.; at 33½ ft. draught of water the displacement will approach 40,000 tons; the weight of the materials in each of the ships and her machinery will be about 30,000 tons. The proportion of length to breadth is not so great as in preceding transatlantic steamers of recent date. The water-line length in the "Lucania" is 9.2 times the beam; in the White Star "Oceanic," 10; in the "Kaiser Wilhelm II," 9.5, and in the new vessels, 8.6 times the beam. This change in proportion secures the association of extremely fine ends with greater proportionate beam, and favors economical propulsion at maximum speed. A notable increase in proportionate depth has also been made; the length at water-line in the "Lucania" and "Oceanic" is about 14 times the depth; in the "Kaiser Wilhelm II" it is 13 times, and in the new vessels about 12.6 times the depth. This increase in relative depth greatly favors longitudinal strength, and the greater length of the new ships will tend to diminish the longitudinal bending moments impressed on the structures when exposed to the action of Atlantic storm waves. The watertight subdivision is very thorough and is much improved by the introduction of the four turbines which are placed in three separate engine rooms. There are six complete decks, including promenade and boat decks. The passenger accommodation will be about 550 first-class, 500 second-class and 1,300 third-class passengers. The complement of officers and men will be about 800, so that when each ship is full about 3,200 persons will be embarked.

*From a paper by Sir William H. White, in the *London Times*.

Working of the Simplon Tunnel.

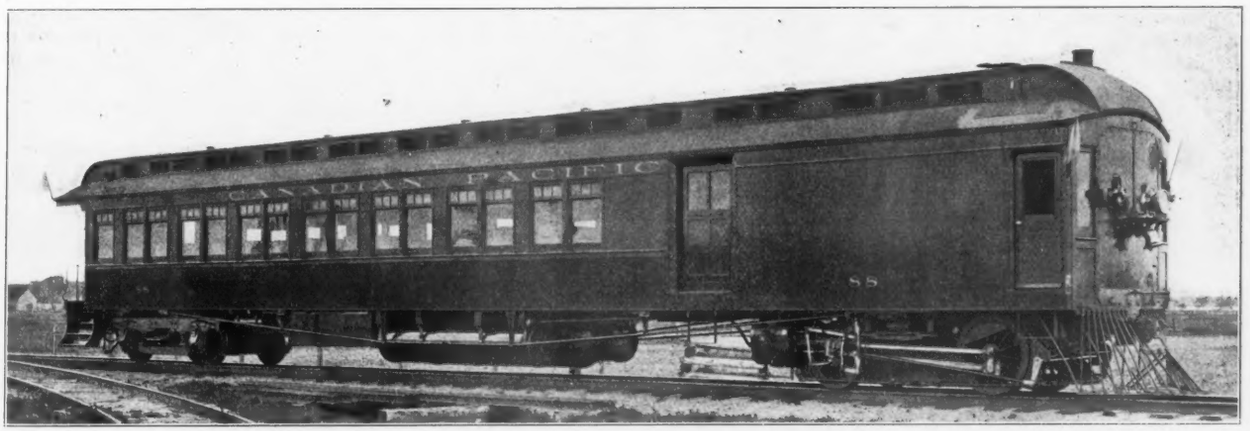
The following notes on the working of the Simplon tunnel are given by a special representative in *The Engineer* for June 22:

The ventilation of the tunnel, although ordinary coal-burning locomotives are still in use, has proved a great success, even though mechanical forced ventilation has had to deal with the natural rock heat as well as the smokiness and closeness of the tunnel. This heat is the only inconvenience which passengers suffer. It is slight, lasting for a short part of the journey, and there is little chance that electric working will cause the least appreciable diminution of it. The popular opinion that the tunnel is badly ventilated is largely due to the action of the trainmen in closing the windows. Riding with windows open all the way makes it clear that the ventilation is very perfect indeed and leaves nothing to be desired other than suppression of the moist hothouse heat near the middle of the tunnel.

On the Italian side, the route from Milan to Domodossola is worked by steam locomotives and cars of the Italian State Railroads. North from Domodossola, at first over Italian territory, the line is operated by the Swiss Federal Railroads, with Swiss rolling stock throughout. A change of cars is therefore necessary except in the *trains de luxe*. The prevailing gradient on this section is 2.5 per cent. For this service a new and very fine type of consolidation locomotive built by the Swiss Locomotive Works at Winterthur is used, two of these powerful engines being required for a train. On the Swiss side, between the tunnel and Lausanne, the maximum grade is only 1 per cent., and on this section four-cylinder compound express locomotives are used. The tunnel was opened for regular trains daily in each direction, besides a tri-weekly *train de luxe*. There appear to be very few freight trains. The tunnel is a single-track line. traffic on June 1, 1906. There are now seven or eight passenger

Steam Motor Car for the Canadian Pacific.

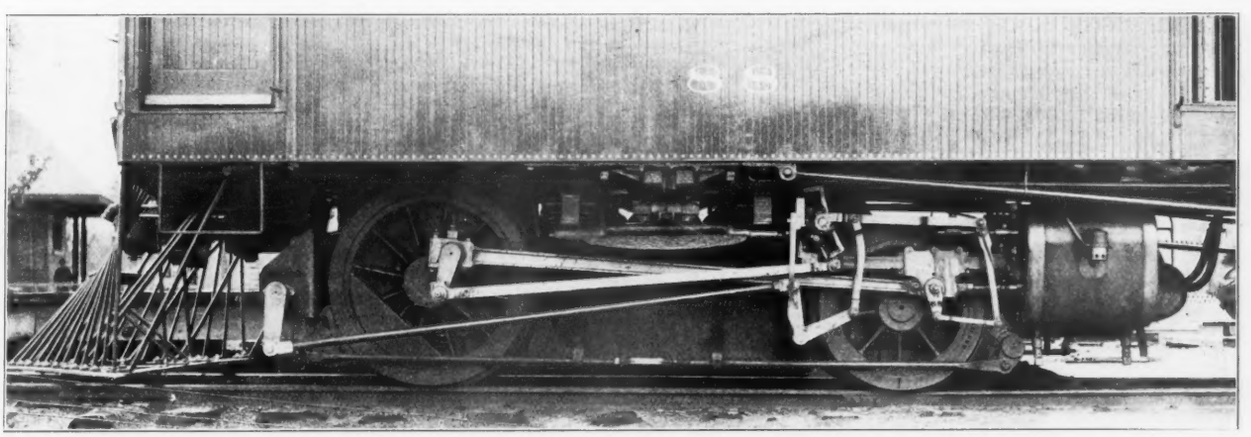
The Canadian Pacific has had in service on one of its branch lines for a period of about two months an oil-burning steam motor car, built from the designs of Mr. H. H. Vaughan, Assistant to the Vice-President. The accompanying illustrations show the general appearance of the car and a side view of the motor truck. The car closely resembles a combination baggage and smoking car, having the boiler and motorman's compartment in the front end. The total weight of the car in running order is 136,620 lbs., of which 82,880 lbs. are carried on the motor truck and 53,740 lbs. on the trailing truck. The weight on the motor truck is divided,



Steam Motor Car for the Canadian Pacific.

42,440 on the forward or driving wheels and 40,440 lbs. on the trailing wheels. The driving wheels are 42 in. in diameter with cast-steel centers, and the trailing wheels are 34 in. in diameter. All journals on the motor truck are 8 in. x 12 in. The main frame is made up of ⅞-in. steel plates. The cylinders (10 in. x 15 in.) are mounted on the outside of the truck frame on the back end and drive the forward wheels. Walschaert valve gear is used, with inside admission piston valves. Steam is generated in a return tubular boiler with an internal combustion chamber. The boiler shell is 4 ft. 6 in. inside diameter and 7 ft. 11 in. between flue sheets. It contains a Morrison corrugated furnace 32 in. inside diameter and 95 1¾-in. tubes, giving a total heating surface of 536 sq. ft., of which 485 are in the tubes and 51 in the furnace. The boiler is fitted with a superheater having 21 1¼-in. steel tubes, with a total superheating surface of 62 sq. ft. The corrugated furnace is lined with firebrick and a sand-blowing device is used for cleaning soot off the tubes. The fuel used is crude oil, which is carried in a tank having a capacity of 2,000 lbs., which is built in the frame of the motor. An air pressure of 15 lbs. per sq. in. is kept constantly in the tank to feed the oil burner. A slot burner of the Booth type is used, and the supply cock and blower are controlled by an automatic device connected with the throttle, so that when the engine is shut off the supply of oil is automatically reduced and no black smoke is emitted. Three cylindrical water tanks are carried under the floor of the car in the center. These tanks have a capacity of 900 imperial gallons, and the water is fed to the boiler by one No. 3 and one No. 5 Hancock injectors. The boiler is designed for a working pressure of 180 lbs., and the superheater increases the temperature of the steam at the valve chest to between 700 and 760 deg. Fahr. The car is equipped with the Westinghouse schedule A. M. T. automatic air brakes, which give a graduated release, especially adapted for this class of service.

In speaking of the results in service of this car before the Master Mechanics' Association at Atlantic City last month Mr. Vaughan said: "We have found on this small car with an engine of about 200 h.p. the results obtained in locomotive practice on large boilers and large engines can be duplicated in every respect. Evaporation per square foot of heating surface is duplicated. The weight of the boiler per square foot of heating surface is rather less than in the ordinary locomotive. We are making four round trips a day, 23 miles each way. Our regular local passenger schedule for 23 miles is 50 minutes. We have made it in 38 minutes with the motor car. There is no difficulty in running at a speed of 50 to 55 miles an hour. The cost of operation is somewhere betwen 15 and 20 cents per car-mile. The oil consumption is 1.8 gallons per car-mile."



Side Elevation of Motor Truck.

Washington Correspondence.

WASHINGTON, July 17.—The Hepburn railroad rate law is on the statute books, but it will not become effective until August 29, and it will be long after that date before it can be known definitely just what some of the provisions of the act mean. Aside from the fundamental question as to the constitutionality of the basis provision of the law—that empowering the Interstate Commerce Commission to prescribe rates—there are other questions of constitutionality and of construction that must be answered in the first instance by the Interstate Commerce Commission and ultimately by the courts before there can be complete certainty as to how much of the law is effective and just what the effective parts provide.

The able arguments of Senator Foraker as to the unconstitutionality of the rate-making feature of the law, supported as they have been by the opinions of former Attorney-General Olney and other lawyers of high reputation, are sufficient to throw at least a shadow of doubt as to this provision standing the ultimate test of the United States Supreme Court. If this shall stand, however, there are still constitutional doubts as to other features of the act, notably as to that empowering the Interstate Commerce Commission to estab-

lish through routes and to fix joint rates. There are also serious questions of legal construction as to the requirements imposed upon carriers and the authority conferred upon the Commission.

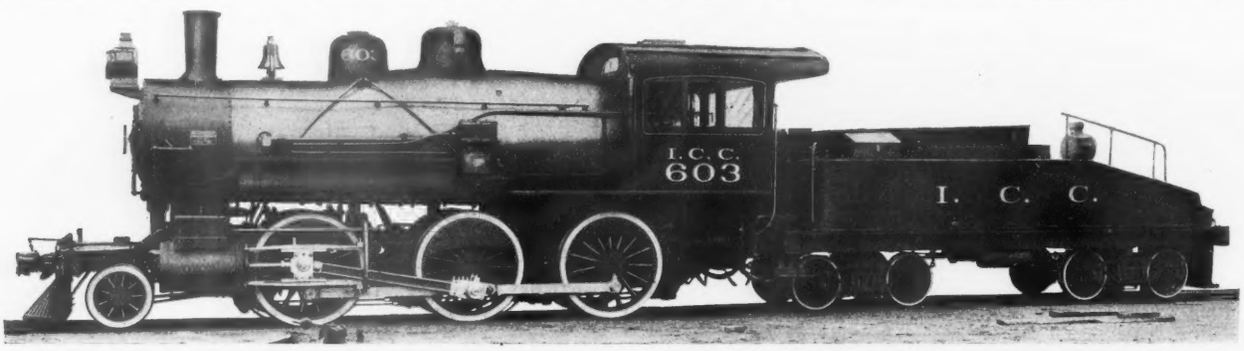
For instance, the debates in Congress revealed decided differences of opinion as to whether this new law, taken in connection with some of the provisions of the original interstate commerce law, will empower the Interstate Commerce Commission to fix differentials and to determine the relation of rates affecting rival communities. In other words, the question is: "Does the law empower the Commissioners to apportion commerce among rival communities and to determine the relative degree of prosperity that each community shall enjoy regardless of the enterprise of its people and of the carriers on which it depends?" Stated differently, the question is: "Shall the commercial rivalries and industrial controversies between competing localities and sections be converted into sectional political controversies to be fought over at the polls in each succeeding election and to be passed upon by an administrative tribunal responsible to no one but the President of the United States?"

This question has been answered in the affirmative by some of the distinguished lawyers in Congress—Representative Littlefield, of Maine, among others, having contended that the law would give to the Commission plenary power over differentials and the relation of rates. On the other hand, the original report of the House Committee on Interstate and Foreign Commerce declared expressly that the bill did not propose to give this power to the Commission, and this view was strongly supported by men of high authority, such as Chairman Hepburn in the House of Representatives and Mr. Dolliver in the Senate. The fact remains, however, that if the statements of the House Committee report and of prominent advocates of the law in both houses as to the intention of Congress are disregarded the law can fairly be construed as giving this authority to the Commission. In this connection it may be recalled that one of the principal grounds on which the Commissioners and other advocates of governmental rate-making, such as Mr. Bacon, of Milwaukee, and former Judge Cowan, of Texas, urged an enlargement of the powers of the Commission was that it should be given this power. It seems reasonable to expect, therefore, that the Commissioners will be predisposed to construe the Hepburn law as giving them authority to fix differentials and to determine the relation of rates. But it is certain that such a construction of the law will not be acquiesced in by the railroads and by the communities that would be affected unfavorably. For instance, in a case raising the same questions as to rates into southeastern territory that were raised by the old Maximum Rate Case, it is safe to assume that all of the Atlantic seaboard cities, from Boston down to Norfolk and Richmond, would be found opposing the Commission as strenuously as would the railroads affected by an order intended to extend the advantages of the Atlantic ocean to the Mississippi Valley. In such a case the Commission could contend with much show of reason that the law clearly authorized action fixing the rates from the Central West with relation to the rates from the seaboard, and an adverse decision by the courts might have to be based on the evident intention of Congress as shown by the House report and the utterances of Senators and Representatives during the debate.

J. C. W.

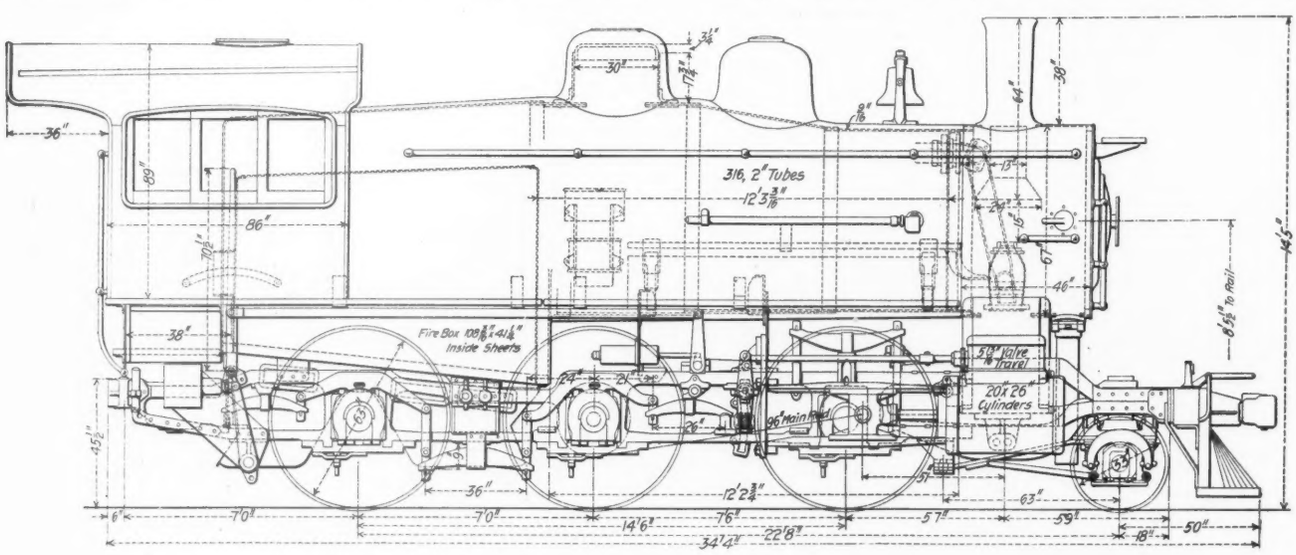
Mogul Locomotives for the Panama Excavation.

The American Locomotive Co. has recently completed an order for 120 mogul locomotives for the Isthmian Canal Commission, to be used in the construction of the Panama canal. They are divided into two classes, one with cylinders 19 in. x 24 in., and weighing 130,500 lbs., of which 100 were built, and the other with 20-in. x 26-in. cylinders, of which there are 20. The lighter engines were built at the Cooke works and the heavier at the Brooks. The common feature of the two engines is to be found in the tenders, which are unusually long and low, and were so built in order to avoid the danger of turning over when used on the rough and uneven roadbed over which they will have to run.



Mogul Locomotive with 20-in. x 26-in. Cylinders Built for the Isthmian Canal Commission by the American Locomotive Co.

The light engine offers no especial characteristics, and is merely an example of mogul locomotive design as it had been developed 10 or 15 years ago. The frame is straight with the firebox on top of it, and is set well forward in the cab, which is thus left roomy and free. Owing to the interest that has been awakened in smokebox arrangement by the paper on that subject presented at the recent meeting of the Master Mechanics' Association, an outline of the netting and petticoat pipe is here given.



Side Elevation of Mogul Locomotive with 20-in. x 26-in. Cylinders for the Isthmian Canal Commission.

It is interesting to note the wide variation in smoke-box design shown in the practice of the same designers. In the case of the light engine with 19-in. cylinders and a smoke-box diameter of 58⅛ in., the stack has a diameter of 14½ in. at the choke, and the bottom of the petticoat pipe is 2 in. above the top of the exhaust nozzle. In the case of the heavy engine with 20-in. cylinders and a smoke-box diameter of 67 in. the same size of stack is used, but the distance between the top of the exhaust nozzle and the bottom of the petticoat pipe is 15 in. Certainly these dimensions are difficult to harmonize when it is considered that the two machines are to burn the same grades of coal, are to run over practically the same tracks, and to perform the same sort of service.

If we take the formula set forth by the committee on smoke-boxes and apply it to these engines we find that the distance of the top of the nozzle below the center of the boiler is 2½ in. in the case of the light locomotives, and 7½ in. in that of the heavy. If, then—

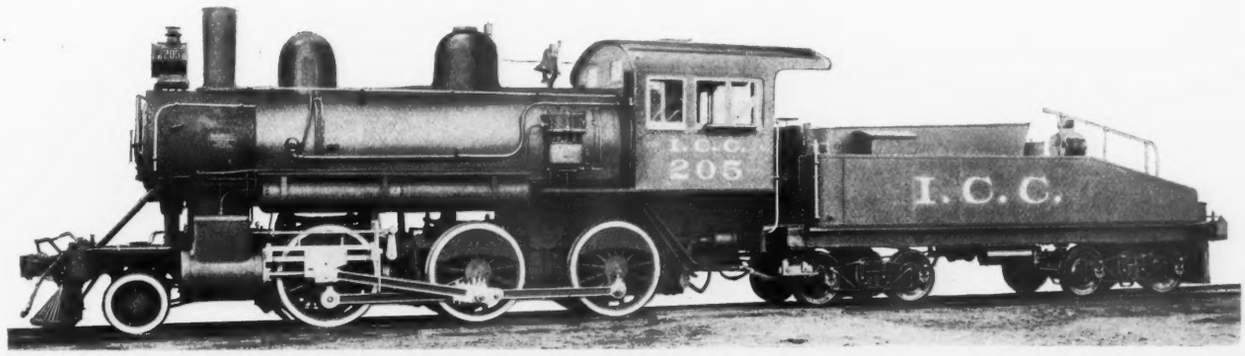
d = the diameter of the choke.
D = the diameter of the smoke-box.
h = the distance of the top of the exhaust nozzle below the center of the boiler,

the formula,

$$d = .21\ D + .16\ h,$$

becomes d = 12.8 in. for the small engine and 15.27 in. for the large one.

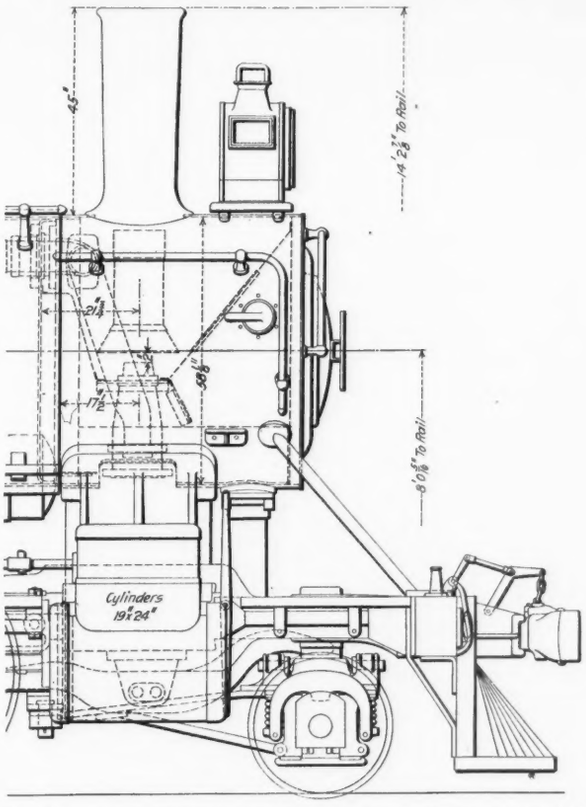
To be sure, the formula makes no allowance for the resistances offered by the netting, and was not presented until after the completion of these engines, and so was not available for use, and the comparison merely serves to show the desirability of greater uniformity and the differences existing in the output of the same firm, differences which extend even to the rate of flare of the stack, the reason for which would be very interesting to have explained.



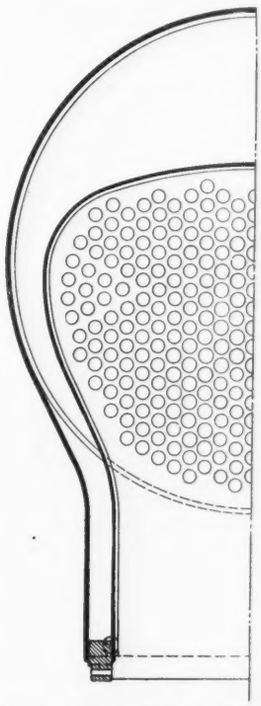
Mogul Locomotive with 19-in. x 24-in. Cylinders Built for the Isthmian Canal Commission at the Cooke Works of the American Locomotive Company.

The larger engine also presents an example of dimensions that are high in mogul construction. The weight is not excessive, but 21,250 lbs. on each driving wheel is well up in the scale of modern practice. The boiler is of the extended wagon-top type, with sheets ⅝ in. thick on the conical section. While in the small boiler the firebox is carried by expansion pads and the mudring runs parallel to the top rail of the frame; that of the larger engine is carried by an expansion pad at the front and a rather heavy buckle plate at the rear, while the frame itself is cut away into a very irregular contour.

The outline of the firebox, illustrated in a special engraving, shows the great amount of flare at the top, and calls to mind criticisms that have been made of similar designs wherein it has been urged that the large amount of steam passing over the sheet in rising, keeps the water away, increases the temperature at the upper rows of staybolts, and tends to increase the breakages that occur at that point.



Front End Arrangement for Mogul Locomotive With 19-in. Cylinders.



Half Section Through Firebox

It is also interesting to note the difference in the thicknesses of the several sheets of the firebox of the two engines for the same boiler pressure. The spring suspension is arranged to use semi-elliptic at all of the drivers, helicals being found only on the truck. This arrangement places a yoke over each of the two rear pairs of driver boxes with hangers reaching down to the ends of the semi-elliptics set between the rails of the frame. These springs thus put a downward pressure on the frames at each end, and by a multiplication of the motion at the hand, will contribute to the ease of motion of the machine, as has been found to be the case on caboose cars where a similar design of spring suspension has been used.

Another point to which attention may be called is the short tube used in both cases. The tubes are only 11 ft. 8 in. in the light engine, and 12 ft. $3^{3}/_{16}$ in. in the large engine, but the shortness of the tubes is compensated by the number, which brings up the old and still unanswered question as to the relative value, for evaporative purposes, of the several sections in the length of the

tube. The following are some of the principal dimensions of these engines:

Cylinders, diameter	19 in.	20 in.
Piston, stroke	24 "	26 "
Wheel base, rigid	13 ft. 4 in.	14 ft. 6 in.
Wheel base, total	21 ft. 3 in.	22 ft. 8 in.
Weight on drivers	114,000 lbs.	127,500 lbs.
" total	130,500 "	147,500 "
" engine and tender	215,500 "	235,500 "
Heating surface, tubes	1,431 sq. ft.	2,029 sq. ft.
" " firebox	134 "	174 "
" " total	1,565 "	2,203 "
Grate area	27.6 "	31 "
Driving axle journal, length	10 7/8 in.	11 in.
Driving axle journal, diameter	8 "	9 "
Truck axle journal, length	9 7/8 "	10 "
Truck axle journal, diameter	5 "	6 "
Boiler, diameter, first ring	58 5/8 "	64 "
Boiler, steam pressure	180 lbs.	180 lbs.
Firebox, length	96 1/4 in.	108 3/16 in.
" width	41 1/4 "	41 1/4 "
" thickness, tube sheets	11/16 "	1/2 "
" " back sheet	9/16 "	5/16 "
" " side & crn sht	5/8 "	3/8 "
" " water, front	4 "	4 "
" " sides & back	3 1/2 "	3 1/2 "
Tubes, number	256	316
" diameter	2 in.	2 in.
" length	11 ft. 8 in.	12 ft. 3 3/16 in.
Tank, water capacity	4,000 gals.	4,000 gals.
Tank, fuel capacity	6 tons.	6 tons.
Valve travel	5 1/2 in.	5 3/16 in.
" lap	1 1/4 "	7/8 "
" exhaust lap	0 "	0 "
" lead in full gear	1/32 "	0 "
Wheels, driving, diameter	54 "	63 "
Wheels, truck	30 "	33 "
Tractive effort	24,548 lbs.	25,245 lbs.
Weight on drivers / Tractive effort	4.64	5.05
Total weight / Tractive effort	5.15	5.84
Tractive effort x diam. drivers / Heating surface	847	722
Heating surface / Grate area	56.7	71.1
Firebox heating surface / Total heating surface	0.08	0.08
Weight on drivers / Heating surface	72.84	57.42
Total weight / Heating surface	83.38	66.50
Volume of both cylinders	7.88 cu. ft.	9.45 cu. ft.
Total heating surface / Volume of cylinders	198.60	233.12
Grate area / Volume of cylinders	3.50	3.28

An American View of British Railways.*

Given, a railroad system which earns each year just about what it earned the year previous, while the capital charged against it is each year materially greater; how are dividends always to be paid at the "usual rate"?

This is a problem which can be worded in many ways; it is subject to much twisting and turning about, while local conditions may greatly modify either or both of the main premises. But the central fact of it is confronting every British railroad manager, and will not down; he has always the skeleton in his closet, and is fortunate if he can keep it hidden. Suffice it, then, to say, at the outset, that the average capitalization of the British lines, as reported by the Board of Trade, stands at some $273,000 per route-mile, while that of our lines is approximately $67,000 a mile.

Taken by themselves, these figures are meaningless. We are comparing single-track lines thrown across the Kansas plains, unfenced and unsignaled, with four-track roadways, splendidly built and safeguarded, leading into the heart of London. As our country grows up to its transportation system, the capital account will swell by leaps and bounds, and, in truth, expenditures during the last 20 years have been out of all proportion to the increase in route-milage. We have fairly entered into the period when the characteristic of railroad progress is the betterment and enlargement of existing facilities, rather than the opening of new territory with hastily constructed lines. But the fresh budget of capital expenditure charged each year against American railroads is bringing constantly increasing returns; the money buys new tools, which enlarge the output of the plant. In England, unfortunately, this is not true. The 23,000 miles of railroad in the British isles cover the country like the filaments of a cobweb; every traffic center is splendidly served already, and not much new is to be hoped for. Gross earnings increase each year, it is true; but they increase very slowly, while the railroad properties, built for all time, three quarters of a century ago, by engineers who had the hardihood to assume that their designs could not be bettered, cannot now be adapted to economical working, but must be carried as best may be, with their terrific burden of capital cost.

To put the matter in a word, the English managers, for the past 50 years, have been capitalizing maintenance in order to pay their dividends. They do not call it capitalizing maintenance. Theoretically, the strict up-keep of the line is paid for out of earnings, and the new capital goes into permanent betterments, larger and more powerful locomotives, heavier bridges, and many other items that leave the company with new assets to set against the new liabilities. But it is only too evident that, in the face of the sharp and ever-present competition in all quarters, these capital costs do not bring new traffic—for there is not much new traffic to be brought—but only serve to retain the existing business, and to keep it from falling into the hands of rival companies. British railroads do not suffer from competition in rates; but they are gradually being bankrupted by competition in facilities.

At the bottom of the difficulty lies the sacredness of the dividend. Broadly speaking, American railroads were built on the proceeds of bond issues; much, if not most, of the original stock was put on the market as a speculative venture, and when the load of capital became too great for the property to bear, the bondholders took possession, wiped out the stock, and reorganized on the best basis they could. Dividends were paid when it seemed expedient; not because the stockholders were deemed to have any particular right to them. The best American railroad practice to-day not merely maintains the property out of earnings, in the British sense of the word *maintain*, but puts it in such shape that it can continue to hold its place in its competitive territory without new capital costs. After that, a generous surplus is carried forward, and then the balance of the earnings is available for dividends.

But British railroads have no bonds; there are simply three classes of stock, debenture, preference and ordinary, receiving dividends in the order mentioned, and profits are shared almost to the last penny—a great company, earning 12 million pounds sterling, carrying forward perhaps £25,000 as the year's surplus.

For example, the balance carried forward as surplus by the Great Western Railway for the half year ending June 30, 1904, was equal to only one twenty-fourth of the common stock dividend requirements for the same period. The dividends, that is to say, absorbed 96 per cent. of surplus net earnings, after a scanty charge for maintenance. Dividends on the Pennsylvania Railroad in 1904 absorbed only about 64 per cent.; on the Lake Shore & Michigan Southern they absorbed less than 40 per cent. Moreover, the English road includes its entire surplus carried forward in the sum available for dividends; while both of the American roads have tremendous accumulated surpluses from past years which they do not so include. The accumulated surplus of the Pennsylvania at the time of its last report amounted to nearly 25 millions; the Lake Shore had nearly 17 millions; the Great Western (England) carried forward $125,000 as its sole reserve.

Just as the British railroad carriage started from the stage coach, and has never gotten far away, so the dividend system is based on the practice of the little manufacturing concern whose three owners repair the roof out of surplus earnings, and divide the cash balance at the end of the year. But the proprietors of the manufacturing concern are on the ground; if they are confronted with competition they can intelligently take counsel among themselves and agree to spend some of their profits in new facilities. Not so the thousands of railroad shareholders. The standard of dividends set by the company may have been extravagantly high at the outset, so that it is maintained at great sacrifice by starvation of the property; but that does not interest them; they want their 5 per cent., or 4, or 3½ per cent. on an investment made in times of greater profits, and they look sharply to the chairman and his board for it. American charges are flexible, for the dividend—which is not a charge at all—can always be reduced or suspended entirely. But the whole system of British railroad capital, based upon a small but regular return, as against the speculative returns in this country, depends on the dividend, and is extremely inflexible. So the capital has piled up, and must continue to pile up until earnings vanish. Our railroads took their hardships and deprivations in their youth; the English lines, after years of great prosperity, are looking forward to certain poverty in their old age.

It has often been said that British railroad traffic had the characteristics of a retail business, while American railroad traffic was analogous to a wholesale business. The extent to which this is true can scarcely be realized by the tourist; the difference is fundamental, and the conditions under which the lines are worked

*From a paper by Ray Morris, in the *Atlantic Monthly*.

are as wide apart as the two continents. Some of the British lines have recently complained bitterly of the serious inroads into their passenger revenue made by tramways working within a radius of, say, three miles from the cities—a traffic that the American manager never had, and does not want. The extreme minuteness, if the term may be so used, of the British merchandise business, tends to destroy all comparisons with American freight-carrying. As a result of these things, visiting railroad offices in either country, newly come from the other, are perplexed and dismayed rather than enlightened by what they see. The British manager on a visit to America sees faulty permanent way construction, locomotives built to be "scrapped" after seven or eight years' service, unpunctual passenger trains, and a great proportion of the country's mileage abounding in grade crossings and worked without block signals. On the other hand, the American manager in England sees a freight traffic that has degenerated into a parcels business, and a network of lines, extravagantly built and extravagantly worked, handicapped by an official formalism that reaches all branches of the service alike, while the capital account hangs over the lines like a black cloud, certain some day to descend in a storm that will wipe out many time-honored values.

British railroads do not have presidents, and there is nobody on the official roll whose authority exactly corresponds to that of the American chief executive. The chairman, often titled and usually a layman, finds it his chief duty to preside over semi-annual meetings and to answer the extremely pertinent questions put to him by the proprietors—for every British shareholder feels the weight and dignity of his proprietorship, and may not be gainsaid. To make, for the moment, a technical distinction, the characteristic organization of a British railroad is departmental; the characteristic American organization is divisional. That is to say, we are prone to make each operating division of the road a separate entity, ruled by its superintendent, who reports to the general superintendent of all divisions. On most of the larger systems there are a group of vice-presidents, each responsible for a main branch of the business, but reporting in turn to the president, while they give the division superintendents, who are the operating units, as free a hand as possible. Our general managers are little more than full-powered general superintendents.

But in the British departmental organization, the branches of the business proceed in parallel lines that do not converge in any central authority. The British general manager is the operating head; but the locomotive-chief gets about the same salary, and theoretically reports to no one but the non-technical directors; while main questions of policy and finance are taken away from the general manager by the board. The chief traffic-manager has a position almost, though not quite, as independent as the locomotive chief. The result is that the general manager, whose duty it is to move the traffic, may or may not be able to haul the trains he wants to; it depends on the locomotive chief whether he can or not; and the locomotive chief, desirous of making a fine record of working economy for his engines, does not always care to overwork them for the sake of enabling the general manager to make a good record of another sort. British railroads often seem to obey the Scriptural injunction not to let the right hand know what the left hand is doing.

Yet in spite of these very patent defects which so seriously affect the economies of working, the fact must not for a moment be lost sight of, that the public service rendered by the British lines, the convenience to the traveler and the shipper, are far in excess of anything to be found in this country. The British Isles are absurdly small when compared with our vast areas, and this of course simplifies the operating problems; there are no snowdrifts to delay schedules, no sections of crudely built track awaiting perfection, and the locomotives are never far from their home shops. Yet, even with allowance for these advantages, both freight and passenger traffic are habitually handled with a regularity and certainty that deserve the highest degree of praise. In any large terminal in England the number of passenger trains that arrive either exactly on time or a minute or two ahead is far greater than that of trains even the least overdue; five minutes is usually a safe margin for an important connection. At Finsbury Park, a suburban station just outside London, trains pass on an average of one every two minutes night and day, yet this tremendous traffic is handled with clock-like precision. This punctuality, moreover, is not confined to the passenger service, and, in comparison with this country, it is in freight-working that it is the most marked.

The English method of handling fast freight is so different from ours in its whole conception and environment—at once so much more expeditious and so much more costly—that there is no common ground for a comparison. As far back as 1885, when Hadley wrote his "Railroad Transportation," he showed that freight could be received in London late in the afternoon and be delivered at the consignee's door, anywhere south of Scotland, the next morning. The main features of this service have not been changed much in the last 20 years; but it has been polished by competition to a wonderful degree of perfection as regards facilities, although the cost of it, both to the railroads and to the shippers, remains an unfailing source of astonishment to the American manager.

One of our great eastern roads sends out four fast freight trains daily from New York; the London and North-Western sends out 28 daily! Moreover, the English company cannot despatch these trains at its convenience, throughout the 24 hours, for the freight does not come in until late in the afternoon, and it must inevitably be delivered before working hours the next morning. So the trains must be worked on what is practically a passenger schedule, and to accomplish this they must be light. The maximum train for this kind of traffic is made up 36 little ten-ton wagons, and in the face of the conditions which have to be met, three tons of paying freight per wagon is considered good loading. That is to say, there must be a locomotive and a train crew for about every 100 tons of fast freight! Incidentally, it may be noted that a single locomotive and train crew handle 2,000 tons of paying freight, when grain is moving, on the New York Central; while this record is considerably exceeded by coal haulage over portions of the Pennsylvania system.

Through stress of competition, practically all kinds of freight are hauled in this extravagant manner in British practice, excepting only coal, pig iron, brick and articles that belong in a similar classification. As a result, the business methods of the provincial shopkeepers have been arranged to fit the conditions. A Leeds tailor carries only a small stock of cloth, his customers ordering by sample. If the order is received by 4 o'clock in the afternoon, the tailor can telegraph the number of the sample to London and receive the cloth by the time he opens his shop in the morning. The purchaser of goods that weigh 50 lbs. or so does not feel the freight charge, and gets a service unequaled in any part of the world; but the habitual shipper finds his freight bills extremely high, since the average rate received by the railroad companies on the goods moved by these fast trains is not far from a sovereign a ton. It is only fair to say that this rate, besides providing for rapid movement, also includes collection and delivery; but it has remained practically unchanged throughout the last 25 years, while every one who has followed the recent arguments against Federal rate-regulation in this country must have been struck with the great decreases in our own freight rates during a similar period. So far as freight movement is concerned, it is a safe generalization to say that advances in the science of transportation have been applied in this country primarily to the reduction of costs; in England to the improvement of facilities.

If I were asked to name the characteristics which, from the standpoint of the casual traveler, make British railroads most unlike American railroads, I should reply unhesitatingly, hedges, and the Board of Trade. Each of these terms is somewhat symbolic, as used. The hedges, perfectly trimmed and laid out like the boundaries of a model garden, suggest the neatness and careful exactitude that pervade the service. They may fairly be made to stand for the politeness of the employees, the "railroad servants," as well; for one does not expect to find rude servants in an old-fashioned garden. The traveler does not see the Board of Trade, but he is surrounded on all sides by its handiwork, and watched over by its inspectors. Specifically, the Board of Trade as a British railroad characteristic stands for the broad masonry station platforms, the overhead bridges from the up-line to the down-line, the absence of grade crossings, the efficient system of block signaling, and the careful inspection and report that follow even the most insignificant accident. More broadly, it denotes the great British public opinion, that may be inefficient, but is always honest and courageous, and carries an influence—whether it expresses itself in the shareholders' meeting or in the columns of the *Times*—which has no parallel in this country. Nor does public opinion, or public serious-mindedness, stop with the proprietors and the critics; the humblest railroad guard feels his responsibilities, and respects the traditions of law and order to an extent that is simply astonishing. He may be stupid; he usually is; but his fidelity to the book of rules and to his own small but essential share in railroad working seems to belong to a different race of individuals from the American trainman, with alertness and carelessness well mingled in his make-up.

The Board of Trade is a branch of the government, and its railroad department is concerned almost solely with public safety. It views public safety broadly; it will not permit any new line to be opened for traffic until its inspectors have passed on it; and the inspectors require compliance with almost countless arbitrary requirements that entail a tremendous expense on the railroad company, and have, in considerable part, no real bearing on safety. Many of these requirements are traditional rather than expedient; if railroads were to be built *de novo* in the year 1906 it is certain that the Board of Trade would be immensely shocked, if not insulted, at the suggestion that a 100-ton locomotive should rely on wheel flanges less than 1½ in. deep to keep it on the rails, at a speed of 70 miles an hour. But the traveler who is not a shareholder has no occasion to worry over excessive safety, and he can feel assured that every British railroad on which he is permitted

to travel has passed a rigid examination at the hands of one of the most critical examining bodies in the world.

The Railway Department of the Board of Trade has four principal inspectors, who are retired army officers—at present three lieutenant-colonels and a major. These gentlemen naturally had no railroad experience prior to their appointment; in fact, the very circumstance of their army career indicates the impersonal, nonpartisan service which is expected of them. Without technical skill, except that which they have acquired in the prosecution of their duties, they stand for dignity and absolute integrity, as representatives of the government. One inspector personally investigates every accident, every new line which it is proposed to open for traffic, every installation of a new type of signal, and the like, and receives testimony much like a circuit judge, except that the proceedings are informal. In due course of time he presents his report, quoting the important testimony, and adding conclusions and recommendations of his own which have practically the force of statute, because of the power possessed by the Board to require compliance on the part of the companies. The reasons gravely alleged by the Board as the cause of a wreck often fail to convince; the remedies suggested may do nothing more than reiterate the need of care in train-working; but the limelight is turned squarely on all the operating methods and physical conditions contributory to the accident, and any real evils that may be discovered are dealt with in no uncertain manner.

For example, at the famous Hall Road accident, on the electrified portion of the Lancashire & Yorkshire, the whole system of facing-point switches throughout the country was under trial, although the primary cause of the accident was an order to proceed, wrongly given, by a signalman. The country was aroused by the accident; but the Board of Trade went about its investigation without haste or hysteria, and laid the entire blame where it belonged—on the mental confusion of the signalman. The American press as a whole can be relied on always to assume, tacitly or sonorously, that a serious railroad accident is due to "corporate greed," implying that if the shareholders cared to spend what they should, they could bring about a condition of perfection that would make accidents unheard of. The British press does not share this attitude of mind, because it places perfect confidence in its Board of Trade. When the inspectors of the Hall Road disaster fully exonerated the facing-point switch from the charge that it was accessory to accidents in general, the press had no more to say on this point. It is easy to imagine the heroic stand which our sensational papers would have taken in such a discussion. They would have formed their own conclusion months before the Board of Trade hearings were finished, exonerating the poor signalman—and incidentally publishing his portrait—placing all blame on the directors, and appealing to high Heaven and President Roosevelt for a law requiring the abolition of facing-point switches.

The British observer is naturally surprised to see that our safety measures are enforced primarily by the newspapers; he is scandalized to learn that the cause of some of our worst accidents is never known, and hence that preventive measures do not follow. For example, the Mentor wreck, on the Lake Shore, is still unexplained, after incomplete and unscientific examinations made by coroners' juries and the inefficient State Railroad Commission. Two things, however, have always worked to hinder really useful work by any national railroad commission in this country: the separate state government system, and the fact that internal communications played so vital a part in the development and in the prosperity of the land that public opinion, at the outset, was not at all critical. What was wanted was railroads; if they could be safe railroads, so much the better; but this was not the essential thing. The early lines across the plains, with all their crudities, were so infinitely superior to pack trains, both in efficiency and in safety, that their shortcomings were not judged harshly. Now we have awakened to the fact that a preventable accident is a criminal thing, and we hold our railroads in low esteem because they cannot at once alter their physical structure to conform to our point of view. It is fair to say, however, that we very greatly need an institution with inspection powers like those of the British Board of Trade, but with expense ideas tempered to the wide difference in situation.

To revert from the Board of Trade to the hedge characteristic of British lines: the baggage system, plus the cab arrangements, never fails to delight an American. He never knows, and never can be made to know, what there is in the system that offers the slightest hindrance to the professional collector of other people's baggage; he is fully convinced that the porter would place on his hansom any bag he designated as his own, without a moment's hesitation. In a country where checks are not used in ordinary baggage handling, the entire system rests on the simple affirmation, "This is my bag." Yet the claim departments of British railroads find that theft of baggage from station platforms is practically a negligible item in their accounting. From the standpoint of the ordinary traveler, the British method is incomparably superior to ours. A four-wheeler in London costs a shilling for the first two miles. Add a few odd pence for each piece of baggage carried outside, and construe the distance liberally, and you may arrive at the station, with all your paraphernalia, for a ridiculously small sum. English visitors to New York habitually dine in tweeds on the night of their arrival, because the expressman, who lightly guarantees immediate delivery of their belongings, finds it more convenient to call the following morning.

The Englishman travels with two kit-bags, a hat-box, an ulster and a rug, and never carries any of these things himself. He marvels at the hidden resources of the American dress-suit case, not understanding the stern necessity that requires us to provide apparel for the day in such form that we can manage it without relying on the porter or the expressman. It has always seemed to me that the polite porters who swarm about English railroad stations were, in the last analysis, responsible for the abominable coldness of the trains; for without the porter's assistance the traveler could not manage his ulster and his rug, and would be unable to regard a railroad journey as akin to a drive in an open carriage. Our trains are overheated, and we remove superfluous outer garments when we travel; English trains are really not heated at all, and the traveler must dress as he would dress on board ship.

Taking into consideration all the differences, great and small, it is hard to say with conviction that the railroad system of either country offers any marked advantage over the other in the comfort it affords the traveler. England is a land of short distances; and, speaking of the lines as a whole, they subordinate their freight business to their passenger business. In this country we unhesitatingly subordinate the passenger traffic. As a result, the English service offers many more short-distance trains, which run with infinitely greater punctuality. But the long-distance traffic—that is to say, the service between England and Scotland—lacks many comfort-giving features to which we are accustomed. The traveler in the fall and winter months is likely to be chiefly concerned by the coldness of the trains, mentioned above. He is also expected to remain in one place throughout the journey; there is no library car at the front of the train, no observation smoker at the rear. In recent years an excellent dining-car service has been maintained on the best trains; but dining-cars are still somewhat of a specialty, rather than an essential feature of a through train. As an alternative there is the basket lunch—a cold chicken, lettuce salad, bread, butter and cheese, designed to be eaten from the lap. Personally, I am inclined to think that an American dining-car affords more nourishment and considerably more variety than does a basket lunch; but this is a moot point. The dining-car at least gives the traveler a chance to move about, and to substitute oak and rattan for plush. The English dining-car, when found, is so thoroughly satisfactory that it may rest quite exempt from the criticism of a reasonably philosophic traveler.

The same is true of the British sleeping car, which, like the diner, is a recent development, but is now always to be found on the Scotch night expresses. Each passenger has a narrow compartment to himself; there are no upper berths, and there is an individual washstand in the compartment. If the journey begins at bed-time and ends at getting-up time, the traveler will be thoroughly comfortable; but if he is bound to a point not reached by his rising hour—Aberdeen, for example—he must needs make up his own berth and remain in his compartment; the cars are not convertible into day coaches, and he must be content with a basket breakfast, likewise eaten from the berth.

The upshot of a comparison between English and American railroads is that each country has provided itself with the system that, broadly considered, answers its own needs the best, and that, when all circumstances are taken into account, neither has much to learn from the other. Certain great defects stand out in each; English railroad financing and American railroad carelessness are both deserving of censure. Yet these defects are quite explainable in their outgrowth from the physical conditions at hand, and they are not amenable to any off-hand remedy. Likewise, certain points of especial attractiveness, such as the English baggage system and the punctuality of trains, and the American luxury of through travel, have arisen from a complicated set of local circumstances, and could not be transplanted unless all the circumstances were transplanted as well. Most forcible of all is the impression gained by such a study that the essential belief, the very creed and doctrine of one country, as regards the economies of its railroad working, may not be so much as discussed in another, where the same ultimate problem is gotten at in a wholly different way.

A preliminary official statement of the results of the operation of the Russian railroads in 1905 shows in comparison with 1904 an increase of nearly 2 per cent. in mileage worked, a decrease of less than 1 per cent. in the number of passengers carried, and a decrease of 6½ per cent. in the number of tons carried. The gross earnings decreased about $25,000,000, or 8⅔ per cent., and the earnings per mile 9 per cent. The Transcaucasian Railroad, which extends from the oil wells on the Caspian to the Black Sea, had a decrease of no less than 40½ per cent. in gross earnings. That part of the Siberian Railroad east of Lake Baikal, over which

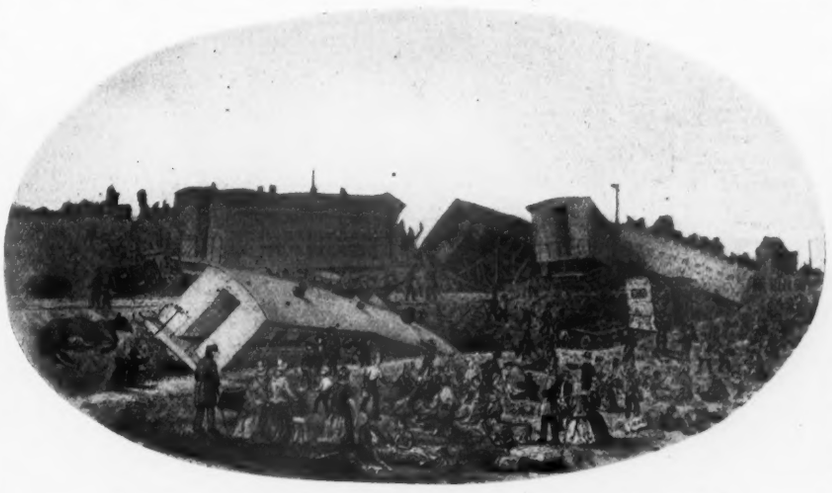
troops, etc., returned from Manchuria, had an increase of 50½ per cent. in earnings; the Asiatic Midland, for reasons which do not appear, a decrease of 19 per cent.

A Train Accident of 1855.

Among the reminiscences published in connection with a recent collision in New Jersey was an allusion, by an old citizen of Burlington, in that state, to a disastrous wreck which occurred on the Camden & Amboy in that town on August 29, 1855, in which 21 persons were killed and 75 were injured. Through the courtesy of Mr. J. A. Anderson, the former Superintendent of the Pennsylvania Railroad Relief Department, now retired, we are able to reproduce a lithograph of the scene of the accident from a drawing which was made at the time by John Collins, a teacher residing at Burlington, now dead. Mr. Anderson was connected with the road in 1855, but did not visit the scene of the accident. He writes interestingly concerning the picture, as follows:

The scene, as depicted, must have been harrowing in the extreme, and one is led to reflect upon the coolness as well as the skill of the artist, who gives it in such minute detail. The picture is interesting, too, as showing something of the quaint costumes of the day and of the construction of the cars, which had side doors at the center and platforms level with the floors, to which the station platforms corresponded in height.

This accident was caused by the train, while backing to reach a siding, coming in contact with a carriage crossing the track. It was the rule then that, when a train having the right of track was late at the schedule meeting place, an opposing train might run to a "meeting post" and the train first arriving there had the right of way, the other being required to back to a siding. The carriage which was the cause of the disaster was being driven by Dr. John F. D. Heineken, a physician of Columbus, N. J., who had with him his wife and three children. All escaped injury, but both horses were killed and the carriage was wrecked. [The people of Burlington were so aroused and agitated that for several weeks the road was compelled to reduce the speed of its trains through the town to about four miles an hour.]



Derailment at Burlington, New Jersey, August 29, 1855.

This accident gave rise to some extraordinary inventions, designed to prevent like occurrences. One was known as the "Heineken whistle." This was a whistle attached to the cylinder of the locomotive, so arranged as to give a blast at each movement of the piston, which, at the moderate speeds of that day, gave the puffs at distinguishable intervals. I remember seeing this in use but do not know to what extent it was adopted nor when its use was discontinued.

Another invention, which was re-invented many years after, was a gate to be shot across a roadway by mechanism operated by an approaching train, when half a mile or so away. If everything worked well this would have been all right for the train, but it might have worked badly for any carriage which should happen to be in the way at the time. I never heard of this going into practical use.

Before the advent of the telegraph as a means for regulating the movements of trains, the methods devised for meeting the difficulties of this part of railroad operation were often remarkable for their ingenuity as well as sometimes for their clumsiness. Some 20 years ago the widely known veteran conductor of the Camden & Amboy, Andrew Quintin, gave me a copy of the following order which he had received:

"Instructions.—Philadelphia & Trenton Railroad, Line 3.—To Andrew Quintin.—Sir: You will leave Trenton at 7, Bordentown 7:30, and Burlington at 8 o'clock A.M. If no flag is up remain on turnout till C. & A. R. R. Line passes, and if no line is in sight when you get to Dauk's, proceed on carefully with a man ahead (at curves), and give New York line the preference, and then continue on to Camden at regular speed if you can arrive by 9:28 (regular time to be at Camden is 9:20) if you cannot arrive by 9:28 stop at deep cut, if you can reach there by 9:35, and remain there till 9:50 if Mail Pilot Line does not arrive. If you cannot reach deep cut by 9:50 stop at Fish House turnout till 9:55 if line is not in sight then proceed carefully to Camden, with man ahead as before.

"Returning you will leave Philadelphia punctually at 2 P.M., and proceed from Camden on the arrival of the Mail Pilot Line provided it arrives 2:30; if not in at that time proceed on.

"The general instructions of the Railroad have been altered so that the train first arriving at the turnout must go on to it.

"You will regulate your watch daily by the office time in Philadelphia.

"The N. Y. 7 o'clock line leaves Burlington at 8:30.

"WM. H. GATZMER.

"P. S.—You will take water at Rancocus when there is water there."

It is not clear whether the above applied to a single day or was in the nature of a time-table with special instructions. This was before the day of centralized management in the operating department. Mr. Gatzmer was then and long afterwards the General Agent of the company at Philadelphia, and his duties included pretty much everything of importance, financial and otherwise.

In the Book of Rules of the Camden & Amboy Railroad, which took effect in December, 1855, the use of the telegraph is provided for in the authorization of "messages" to be "written and signed by the conductor of a train or the driver of the engine who may order the message." The rules governing the matter are too long for reproduction here, but it may be said that they leave it to the conductor to determine whether his train shall go ahead, on authority of a message prepared by himself, as against a delayed opposing train.*

Malaysian Railroads.

In the Federated Malay states, Provinces Wellesley and Malacca, the operated railroads amount to 396 miles, exclusive of the Sungei Ujong Railway. The length of branches is 74 miles, exclusive of the Sungei Ujong Railway, 25 miles, a guaranteed road worked by a company. All of the railroads in Province Wellesley, Malacca and the Federated Malay states—that is, Perak, Selangor and Negri Sembilan—have been built and are operated by the Federated government. The colonial government supplied funds to build the Malacca branch, Tampin to Malacca, 21 miles. When completed, the Federated government purchased it from the colonial government. The total expenditure on open lines up to Dec. 31, 1905, amounted to $18,630,961 gold, which includes all expenditures, and the formation of four ports, also works at Penang and Malacca ports. The whole of this money has been supplied from current revenue of the Federated Malay states.

The total length of the main trunk line, Johore Bahru to Prai, in Province Wellesley, will be 472½ miles when completed. There is a five-mile steam ferry between Penang and Prai, the northern terminus of these railroads. From Johore Bahru to Woodlands, Singapore Island, there is a steam ferry one mile; Woodlands to Singapore city the railroad distance is 15 miles. The total distance from Singapore to Penang by railroad will be 487½ miles, steam ferry six miles. The distance from Johore Bahru to Johore-Negri Sembilan frontier is 120½ miles, now under construction, and good progress has been made for 30 miles from both ends. Exclusive of the construction in Johore territory, there are 33 odd miles under construction south of Tampin, 21 miles of which is ready for opening. The line should be completed in two years or less, when a through service can be begun. With completion of the main trunk line and branches, transportation facilities for products of the native states will be greatly improved. Other lines are contemplated running northerly through Pahang, for which preliminary surveys have already been made, and routes have been explored through Kalantan, a province of southern Siam, to Kota Bahru at the mouth of Kalantan river on the coast of the China Sea. These prospective lines would open up valuable tin-bearing territories and give easy and cheap transportation facilities to sea ports.—*Consular Report.*

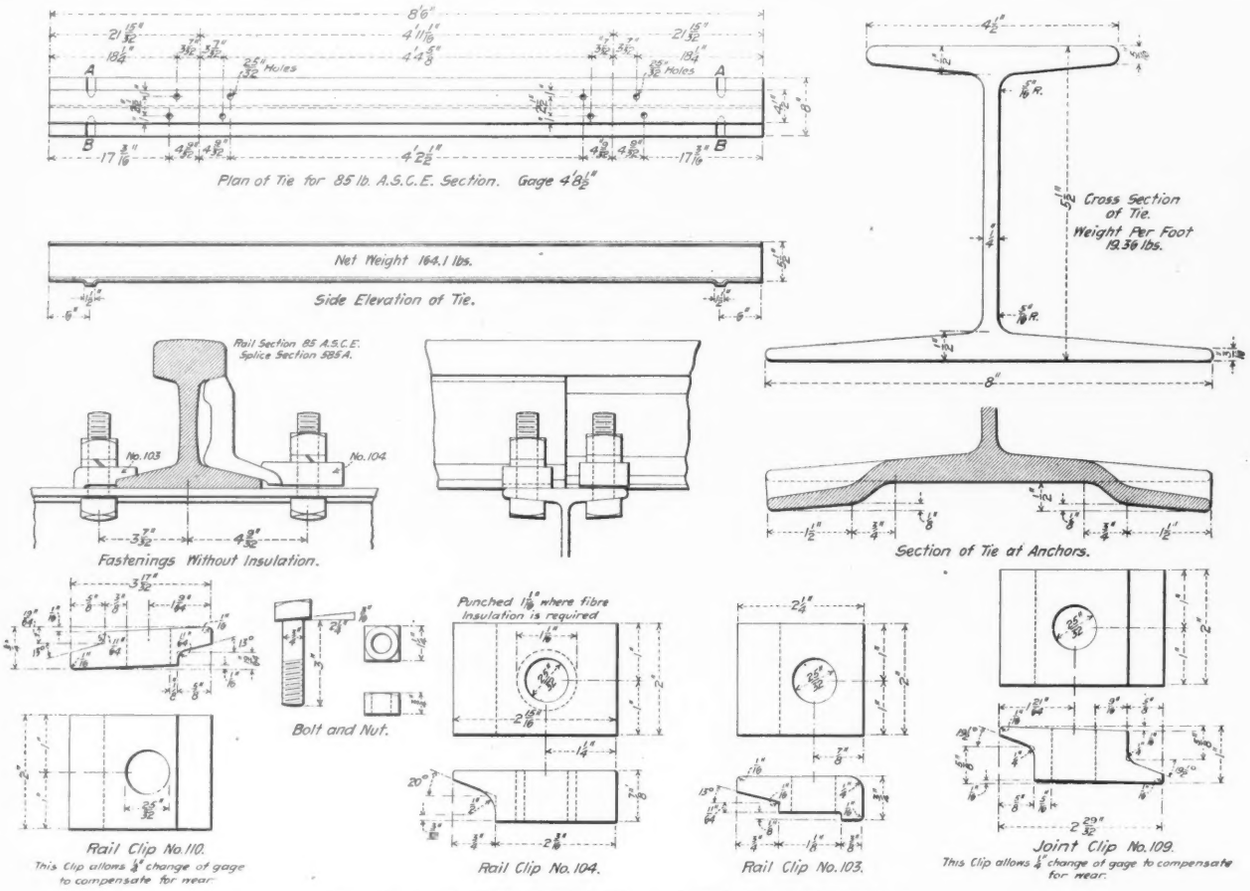
*The "meeting post" rule in the same book is as follows: "When trains from opposite directions are seen from each other between two turnouts, both shall stop, and the one farthest from the meeting post shall give three loud, short puffs of the whistle, and then go back—preceded always by a man on foot, with a red signal—to the turnout, to which the other shall follow closely, and pass without unnecessary delay to either train."

The Carnegie Steel Tie.

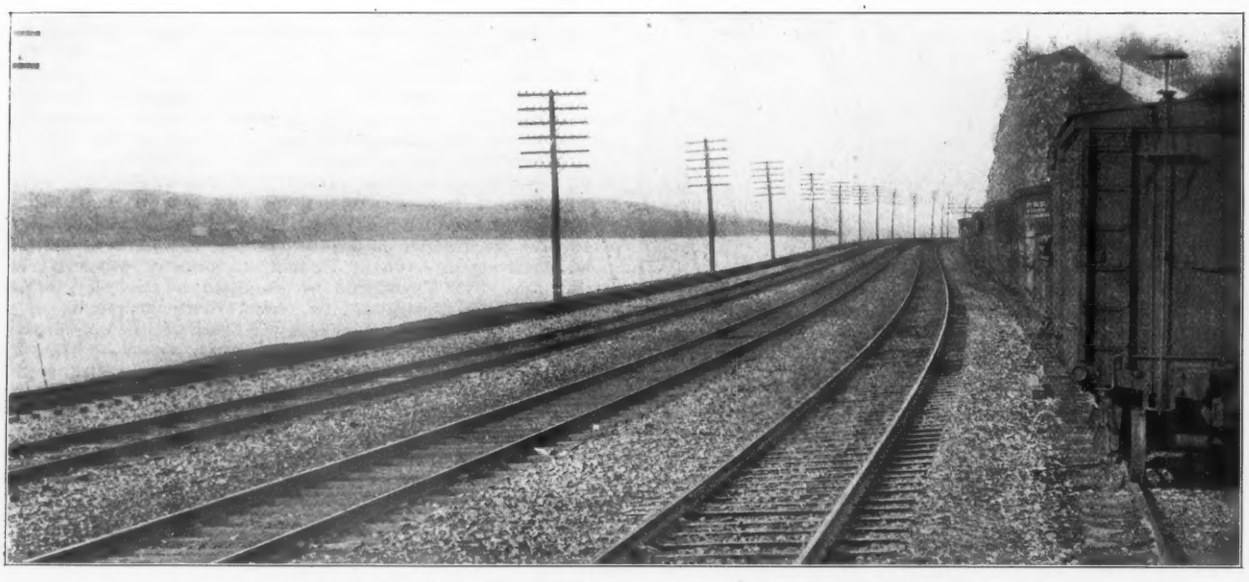
We recently asked the Carnegie Steel Co. for information concerning the present status of steel ties in the United States. The reply to our inquiry from one of the officers of the company was so comprehensive that we print it below in full.

The first steel tie of this general pattern was made with a 4-in. I-beam having a plate 4½ in. wide riveted on the top, and one 8 in. wide on the bottom. Several of these were placed in tracks of the Lake Shore & Michigan Southern at Sandusky, Ohio, seven years ago, and an examination made not long ago showed that there was no deterioration. In fact, the edges of the sheared plates are as plainly defined as if sheared recently. At the same time this examination was made it was observed that wood ties which were placed in track at that time had decayed and were being replaced.

The Carnegie Steel Company followed this experiment with the installation three years ago of several lots of ties rolled in the same shape around Homestead Steel Works and on the Bessemer & Lake Erie. While these ties were put in by the regular track force with no special supervision, the results were sufficiently satisfactory to warrant an additional installation, and the Bessemer & Lake Erie, during 1905, put in 25,000 at various points on their line where it was most difficult to maintain the track. Between Euclid and Queen Junction, a distance of about five miles, the southbound main track is entirely equipped with these ties, and it is without doubt the most perfect piece of track on the road. While the curves are sharp a train running at a speed of 55 miles an hour runs as smoothly as if on tangent. The noise is less than on wood



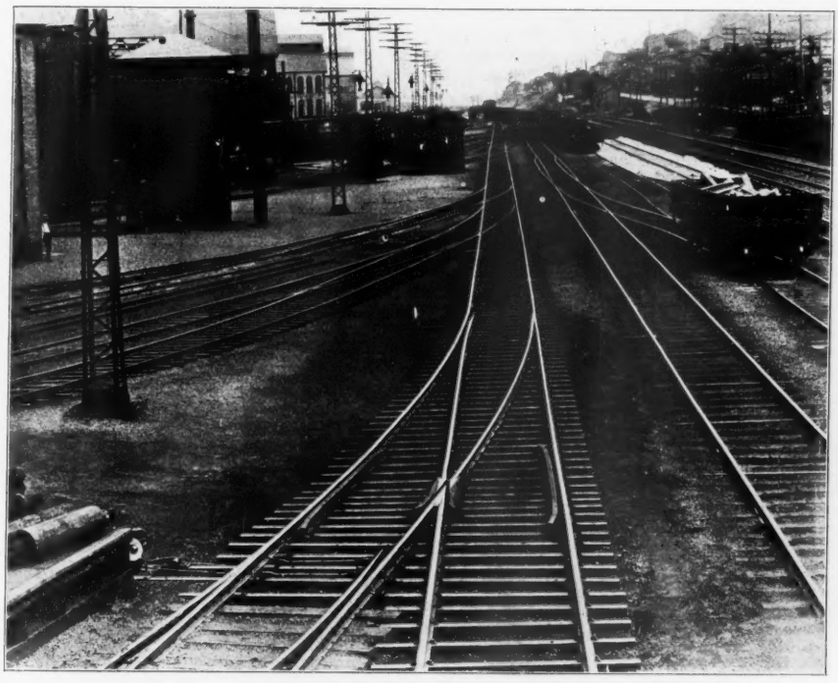
The Carnegie Rolled Steel Tie and Details of Fastenings.



Steel Ties in Track of Pennsylvania Lines West near Emsworth, Pa.

ties, the gage is uniform throughout and the surface and line can be maintained with less labor than needed on wood ties.

The traffic on this track is both passenger and freight, the speed of the passenger train being limited to 55 miles per hour, while the freight trains do not exceed 35 miles per hour. At points where installations were made two years ago it is demonstrated that the gage remains exactly the same as when ties are first installed, except for wear on rail. The wear on the rail is absolutely uniform, and examination of the wear of rail on wooden ties shows that the rail at the joints does not wear quite as fast as at other points, and that in a year's time, even with tie plates, the low rail turns outward. On steel ties this does not occur and there is much less flow of the material on the low rail than on wood ties. This road has ordered 80,000 of these ties for 1906 renewal, and is using them for maintenance by spotting them in where it is necessary to remove worn out and decayed wooden ties. In construction work they are laid down on the roadbed whether it be wet or dry, and results are practically the same as those from wood ties. In other words, the substitution of steel for wood entails very little additional inconvenience. The steel tie has a special advantage around switches as it can be cut to any length and the cost per foot is no more than for the ordinary cross tie, which, when a full switch set is considered, means that the first cost of a set of switch ties is not over 25 per cent. of the first cost of wood switch ties with tie plates.



Steel Ties in Yards of Homestead Steel Works, Pittsburg, Pa.

There were 46 sets of switch ties placed in tracks at Homestead Steel Works during 1906, and all tracks built or rebuilt at these works will hereafter be equipped with steel ties, as it has been found that where traffic is extremely heavy and the radius of turnout is small, that there is an immediate economy in maintenance with the use of these ties.

The insulation required on account of automatic signals is met by the use of ¼ in. fiber shims beneath the rails and a specially insulated clip constructed by means of fiber placed between the clip and a steel bushing in such a way that there can be no wear on the fiber, the point of contact between the bolt and the clip being steel. The steel tie has been used somewhat in street railway work; the Pittsburg Railways, of Pittsburg; the Manufacturers Railway, of St. Louis, and Cleveland Electric Railway, of Cleveland, having installed last year quantities of cross ties and switch ties, and reports from all these points are that ties are giving good results. Physical tests of the tie show that a load of 170,000 lbs. can be placed upon it before there is any sign of failure. In a test of the fastenings recently made by mounting a rail on the tie, and standing it on end, applying the load vertically, it was found that with 17,500 lbs. load the top flange began to buckle, permitting the rail to release itself. A similar experiment with a rail spiked to an oak tie with two spikes showed a failure with a load of but 4,700 lbs.

The steel tie in principle should be an anti-creeper, as the fastening between the rail and the tie is rigid, and on the Bessemer & Lake Erie it has developed that less trouble has been experienced on account of rail creeping on the steel ties than on wood ties in same location. We have had no reports of any broken rails except on the New York Central, where there were quite a quantity broken during the winter of 1904-5. This it is thought was due to a very high carbon rail, as there were a number of breaks on wood ties also. The ties at this point were installed late in the fall and may not have been surfaced perfectly before the track froze up. The past winter, however, there has been very little trouble with any broken rails. Track men after some practice find the steel tie as easy to tamp as the wood tie.

The following roads have installed these ties prior to 1906:

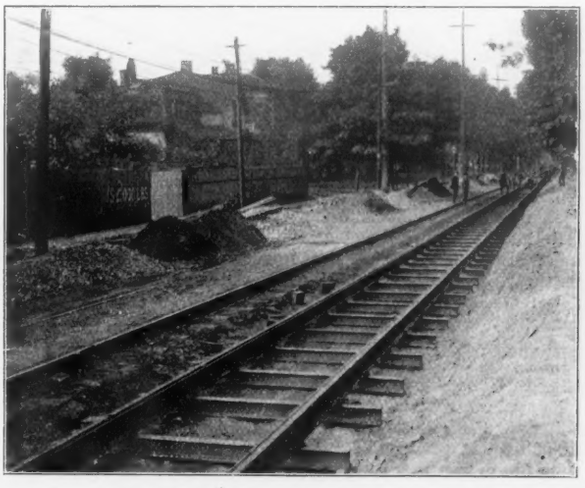
Pennsylvania Lines West of Pittsburg.
Lake Shore & Michigan Southern.
New York Central.
Bessemer & Lake Erie.
Manufacturers Railway, St. Louis, Mo.
Pittsburg Railways, Pittsburg, Pa.
Cleveland Electric Co.
Duluth & Iron Range.
Northern Pacific R. R.

The following railroads have been furnished steel ties for 1906 installation:

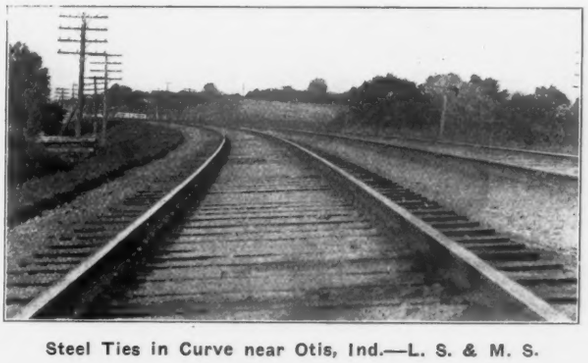
	Miles.
Bessemer & Lake Erie	30
Union R. R.	11
Baltimore & Ohio	1
Pennsylvania Railroad	1
Buffalo, Rochester & Pittsburg	1
International Railway, Buffalo	5
Mexico Electric Tramways, City of Mexico	4
Entre Rios Ry. Argentine Republic	¼

Besides the above, lots varying from 10 to 100 have been furnished to three or four other railroads.

Attention should be called to the punching in the top of the tie. At present four holes are punched at each end, the inner holes of the group taking care of the intermediate points of rail, the outer taking care of the joints. Almost all the ties in track



Steel Ties in Street Car Track—Cleveland Electric Railway Co.



Steel Ties in Curve near Otis, Ind.—L. S. & M. S.

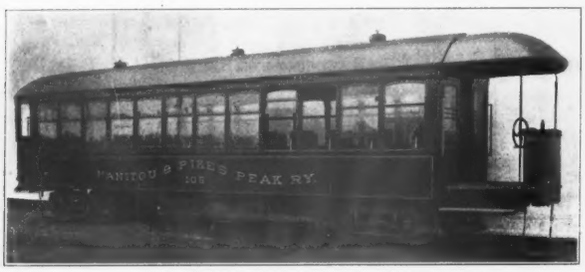
to-day are prepared in this manner. We, however, have placed some in tracks of the Bessemer & Lake Erie where we have notched the splice bars sufficiently wide to admit the clip, thereby eliminating the use of two kinds of clips. This method will be of advantage inasmuch as the inner group of holes at each end of the tie can be for the rail in track at present, while the outer group can be used for the next heavier weight of rail a road is liable to use.

Reference to the blue print shows two kinds of rail clips. Clips Nos. 103 and 104 are used altogether on the Bessemer & Lake Erie. Clips Nos. 109 and 110 have been furnished to the Buffalo, Rochester & Pittsburg Rail, the Pennsylvania and the Baltimore & Ohio. These clips allow an adjustment in the gage of the track made by turning the clip upside down, which causes a movement in each rail of ¼ in. This was done so that after the rails had worn off an inch out of gage they could be readjusted to the original gage.

Observation Car for the Manitou & Pike's Peak Railway.

Last week the new rack locomotive for the Manitou & Pike's Peak Railway was described and illustrated. A new observation car for the same service has just been completed by the American Car Company, St. Louis, which is illustrated herewith. It is the Brill semi-convertible type, both sash, the upper and lower, being arranged to raise into the roof, giving the entire window opening, from arm-rail to letter-board, for the free circulation of air. This also permits an unobstructed view for the passengers, giving full opportunity to view the scenery as the car ascends or descends the mountain.

There are some special features in the design of the car, one being the arched roof instead of a monitor deck. To provide suitable ventilation when the windows are closed, there are three Star ventilators in the roof. The car is 33 ft. 4 in. long over end panels and 41 ft. 4 in. over crown pieces. There is a 3-ft. platform at the forward end and a 5-ft. platform at the rear. The body is especially designed to withstand the stresses of the constant vibration of the rack locomotive.



Convertible Car for the Manitou & Pike's Peak.

The seats have the proper angle to enable the passengers to sit level when the car is on the steep mountain grades. They are covered with plush and the ceiling is painted a dark green, the finish of the interior being cherry. The curtains are silk Pantasote, in green to harmonize with the other decorations. The interior is most pleasing in appearance.

The front end of the car is vestibuled. The rear dash-board is made with an opening in the middle, with a slide therein, to permit passage from car to car when desired. The window sash are the Brill semi-convertible type with the latest design of metal sash stiles. This type of car allows the omission of sash pockets required for drop sash, giving an additional interior width of about 7 in., which is utilized for longer seats and a wider aisle.

The car will be mounted on a special design of truck of the railway company. The truck shown in the view was placed under the car merely to enable the photograph to be taken.

Belpaire Versus Radial Stayed Boilers.

At the last convention of the Master Boiler Makers' Association, Mr. W. H. Laughridge read a paper in which he urged the advantages possessed by the Belpaire boiler in comparison with those of the radial stayed type, on the ground that it is the more scientifically designed and better constructed of the two. The first cost is somewhat higher but this fades to insignificance when the expense of maintenance is considered. This decreased cost of maintenance appears in the fact that it is not subject to the same ailments as other boilers, for which no cure has yet been found.

For example, cracking of the firebox, flue sheet at the top flange and the side sheets where they join the flue sheet, occurs very frequently in the radial stay type of boiler but never in the Belpaire. The reason for this is that the Belpaire, with its flat crown sheet and short right angle flanges on the sides, stayed to a corresponding flat surface on top, permits both sheets to breathe; a condition essential to the life of the sheet, and the more evenly this breathing, or expansion, is extended over the entire surface, the less will be liability to fatigue and rupture.

The radial boiler with its crown sheet arched transversely with side flanges from 5 to 20 in. deep, formed with a radius of from 3 to 10 in., and stayed to a semi-circular top sheet, forms a combination which can be guaranteed to prevent the crown sheet from breathing and also the adjacent sheets. The result is that the top of the flue sheet cracks, and also the top of the side sheet where it joins the crown sheet.

It is quite natural that this should happen, because the flange riveted to the end of the crown sheet makes it impossible for the top of the tube sheet to expand uniformly in any direction. So the arched sheet, being stiffer than the tubes, travels forward and cracks the tube sheet. The reason why this occurs in the radial stayed boiler and not in the Belpaire is because the former is arched and rigid, and the tube sheet is higher at the center, and expands more at that point than it does at the corners, causing an unequal strain. But in the case of the Belpaire, the flat surface expands uniformly with a distribution of the stresses which are not concentrated at one point. The trouble with the radial stayed boiler does not end here, as the staybolts share in the destruction, and for the same reasons. The top and bottom of the firebox being rigid, the only alternative for the vertical sheets is to bulge between the staybolts, the result of which is that many more staybolts are broken in the radial stayed than in the Belpaire boilers.

Interior of Convertible Car for the Manitou & Pike's Peak.

Some Essentials in Locomotive Boiler Design.*

BY D. VAN ALSTYNE,
Mechanical Superintendent, Northern Pacific Railway.

When we consider that boiler repairs constitute one-third of cost of locomotive repairs, fuel one-half of total cost of locomotive operation, and that one-half of engine failures are directly or indirectly chargeable to boilers, we cannot fail to realize the importance of directing a large part of our effort in locomotive design toward production of a boiler which has minimum cost of repairs, maximum efficiency and is most reliable. Some results to be sought for in good boiler design are:

1. Reliability and economical maintenance, i.e., freedom from cracked sheets, leaky seams, leaky and broken staybolts and leaky flues.

2. Continuous development of maximum horsepower within the capacity and endurance of the average fireman.

3. Efficiency approaching as closely as possible to that of best stationary boilers.

Reliability and low cost of maintenance depend chiefly on freedom of circulation around the firebox. Since circulation depends upon the head creating it and the size of the passages through which the water must flow from the barrel of the boiler to water legs around firebox, it follows that the greater the depth of firebox and the wider the water legs the more rapid the circulation. This depth should be obtained by maximum depth of throat sheet and not by raising the crown sheet at the expense of steam space.

Experience with smoke consumers and fuel oil has demonstrated the inability of the ordinary locomotive firebox to withstand the heat of perfect combustion, no doubt due to the fact that natural circulation is unable to supply the firebox with water rapidly enough

*A paper read before the North-West Railway Club, at St. Paul, Minn.

to prevent overheating. It is doubtful if it is possible through natural circulation under the best possible conditions to build a boiler whose firebox will withstand the heat of perfect combustion, but when coal is burned in the ordinary manner the better the circulation the less firebox troubles. It is probable that there is a point beyond which the speed of natural circulation cannot be forced and somewhere below which is the maximum reliable capacity of the boiler; and so far as the firebox is concerned it would appear that forced circulation is very desirable if it could be made practicable.

The greater the length of firebox the greater the volume of water required to pass from the barrel of the boiler into the water legs, hence side sheets and staybolts of a short firebox are less likely to give trouble than a long one. The tendency, therefore, should be toward a decided increase in depth of throat and width of water space and as short a firebox as is consistent with necessary grate area. The result will be an exceedingly heavy and bulky boiler at the firebox, necessitating the use of a trailer truck which it is likely will eventually have four wheels instead of two.

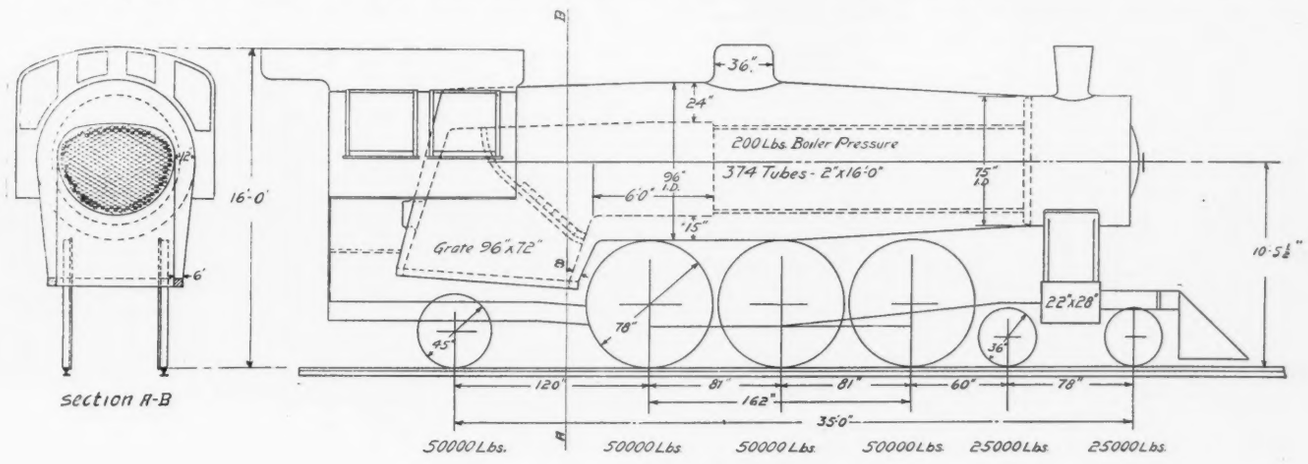
With reference to flues, considerable observation leads me to believe that a comparatively wide bridge—say 1 in., or possibly more—is desirable for large boilers because of the greater stiffness of the flue sheet, and probably better circulation between flues. Wide spacing, however, does not cure leaky flues, which are the most difficult boiler trouble to control. I think it can be satisfactorily shown that the rolling of a flue into a sheet is a water-tight job to withstand almost any degree of heat, provided the flue and flue sheet can be made to expand and contract together, and therefore that when flues leak the conditions are such as to make the flue try to expand more than the sheet, and in so doing it is compressed and made smaller than the flue hole in the sheet. The length of flue, quality of water and coal, method of firing and working injectors, weather and severe service all have an influence on the leakage of flues, and this influence is exerted chiefly through their effect on the size of the nozzle. Whatever causes, therefore, have the greatest tendency toward reducing the nozzle would be the most productive of leaky flues. These, I believe, are poor coal and severe service. The smaller the nozzle the more severe the blast and the greater the blow-pipe action on the end of flues, making them hotter than the sheet, which compresses them so that they are smaller than the sheet when they cool down. So far as my investigation goes, the great majority of leaky flues are below the center line of the boiler, indicating that the short flames of highest temperature enter the lower flues. Hence the need for the greatest possible depth of firebox below the flues so that these hottest flames cannot reach them.

Any other means of keeping the intensest heat away from flue ends will have the same good effect on flue leakage, and recent experience with a combustion chamber which sets the flue sheet 3 ft. ahead of the throat sheet has shown a marked decrease in flue leakage. Of utmost importance, however, is the care of boilers. The most poorly designed boiler is made better by more care, while the best designed boiler will not do well if neglected, and some of the important features in good care of boilers are regular and thorough washing out and blowing off, washing out and filling up with hot water, uniform boiler feeding and avoidance, as far as possible, of working injectors when the engine is not working steam, removal of broken staybolts promptly, and intelligent expanding of flues. Water treatment has done much to reduce boiler troubles, but it has its limitations and should not be attempted until the possibilities of design and systematic maintenance have been exhausted.

To sum up, the locomotive firebox in its fullest development should be much larger and heavier in proportion to the barrel than it is now. It is quite likely that it will be necessary to carry the overhanging weight back of the drivers on a four-wheel trailer truck. The tendency for road engines, either freight or passenger, will be to make the dead weight due to increased size of boilers a larger percentage of the total weight. This increased dead weight, however, should not be a matter of concern so long as it increases the reliability and efficiency of the boiler. The limiting capacity of the fireman is sufficient reason in itself for striving in every way to increase boiler efficiency, either through better boilers, superheating or compounding.

I think it is not an over-statement to say that no heavy road engine should be built with weight on drivers more than 70 per cent. of the total weight, and the lower this percentage is the more reliable and efficient the engine will be; it being understood, of course, that as much of the dead weight as possible is put into the boiler.

These principles are illustrated in the accompanying illustration of a heavy Pacific type locomotive. This represents an engine that has never been built—that is, no passenger engine of that weight has ever been built. Everything is exaggerated on it in order to show the possibilities, and what the views set forth in this paper would lead to in locomotive design. It will be noticed on the cross-section that there is 12 in. of water space at the crown sheet and 6 in. at the mud ring; that there is 8 in. at the throat, and the bottom of the mud ring is about 4 ft. below the lowest flue. The length of these flues, on account of the large drivers, would be 22 ft. if the combustion chamber were not in. This engine has out of a total of 250,000 lbs. only 150,000 lbs. on the drivers. This is rather a small percentage, but not so small as a good many Atlantic type engines now running. It will also be seen that the total heating surface, 3,527 sq. ft., would ordinarily be considered low for an engine of that size; but the greatest possible number of square feet of heating surface is not the thing most to be desired. What is wanted is the greatest possible number of feet of heating surface that will be effective. What seems to be an especially good feature of the combustion chamber, if it is practical, is that it very materially increases the heating surface of the firebox. This is 334 sq. ft.; and it does not need much argument to prove that the firebox is what does the best work in an engine's steaming. There is not much to be gained in getting shorter flues, but no doubt there is some advantage. The great advantage of the combustion chamber is in getting the flues away from the fire.



General Design of Large Locomotive.

DISCUSSION.

In the discussion of the paper it was brought out that after having been in service several months the tubes of the engine with the combustion chamber were free from any evidence of fatigue, and the chamber itself from any leakage. This is in marked contrast with the combustion chambers used on a few Northern Pacific engines some time ago, which were not a success. The success of the later engines is probably due to the fact that the sheet is flanged evenly, with an easy bend. The engines referred to that gave trouble with leakage are excellent steamers.

In the matter of leakages, it was claimed that the tubes on light engines gave much less trouble than those on heavy ones, though the temperature of the fire be the same in both cases. This was partly attributed to the increased length of tube in large engines. Two classes of freight locomotives furnish a case in point. The smaller engines are moguls weighing about 125,000 lbs. on drivers, and on low grades these engines have given the most satisfactory

service of any modern engine. They run from one water station to another, and are going all the time, and there is little or no staybolt trouble. They have been run 17 or 18 months between shoppings, and without a broken staybolt. Trouble with tubes is reduced to a minimum. The other engine is a consolidation, with the boiler exactly the same type but larger. These engines do not give nearly the service in the same districts as the moguls. Flues pull loose and staybolts give a great deal of trouble.

The Pacific type of boilers are built on the same general lines, and, while these engines are in very severe service, the trouble on the road is not great. It is after the engines reach terminals that the trouble begins.

With reference to circulation, experience with smoke consumers and fuel oil has shown the inability of ordinary locomotive fireboxes to withstand the heat of perfect combustion, and also that a most excellent smoke consumer was also a firebox consumer. It made a fine steaming engine, but it was impossible to keep up the firebox. It has been the experience very generally with smoke consumers that they require such rapid circulation that water is not supplied fast enough to carry away the heat. This has also been true of fuel oil burners. It is out of the question to turn the intense heat of the combustion of fuel oil directly against the sheet, and it is doubtful if it is possible to create sufficient natural circulation in a large boiler to take care of perfect combustion.

In regard to care of boilers, it was urged that the development of the locomotive has brought about such conditions in train operation, especially increased tonnage, that on most railroads the fireman cannot stand the strain. This is not altogether due to the fact that firing is so hard, but that so much time is spent in getting over the road. This is a serious difficulty on the large railroads. The modern locomotives of to-day would be far more economical if the runs were not over 10 or 12 hours. On any locomotive, good or bad, if it takes 18 hours to get over the road the service of the last eight hours will be much inferior to that in the first 10 hours—firing, running, and everything else.

With shortening of hours must come education of engineers and firemen in the care of an engine on the road, especially when standing on sidings. They arrive at night and are housed, but no work is done on them. There was a great deal of trouble with leaking, and it was hard work to fire them in the morning. The plan of keeping them hot all night was then adopted, with marked success. As the tubes of the Pacific engines that gave trouble were 18 ft. 6 in. long, and as the combustion chamber of the engine under consideration had a depth of 3 ft., it was suggested that this shortening of the tubes might have something to do with the freedom from leakage.

It will also be of advantage to increase the width of the bridge between the tubes. Ample space for water circulation is space put to a good advantage, and, in one case, 40 tubes were removed from a boiler having about 200, with no detriment to its steaming qualities, while the trouble with leaky tubes was lessened. Much of the trouble with leaky tubes was attributed to the small size of the exhaust nozzle on heavy engines, which is not large enough for the cylinders. These small nozzles are needed for the poorer grades of coal, and then, when better coal is used, no advantage except better steaming is gained. There is no doubt that, when pulling out of a station with a heavy train on a heavy throttle and the lever in the corner, there is a severe strain on the flues. Heavy local trains show it. Frequently the engines on such trains have more leaky flues than a through train that goes right along, for the reason that, with the severe exhaust in starting with the lever in the corner the ash pan opening cannot take care of all the draft, taking it through the firebox and heating it before it comes to the flues; therefore a certain amount must come through the firebox door. The way to overcome this difficulty is to mild the exhaust getting out of the station—not to have the pull on the tubes as at present. It would, therefore, be well to experiment further with the front end when, by a proper regulation of draft, there would be less trouble with leaky tubes.

The author of the paper took the position that the fundamental cause of leaky tubes is that the intense heat in the lower tubes tends to make them expand and the fire sheet, which is somewhat cooler at the bottom because all the cold water is there, has less tendency to expand with the flues. Therefore the flues try to get bigger than the hole, and when they cool they are smaller, because they have been compressed. Therefore a benefit will be derived from setting the flue sheet ahead. It protects the tubes from the intensely hot short flames. Anyone who has observed the fire in fireboxes has noticed that some of the flames are short and intensely hot. These little short flames do not reach the upper tubes, while the long flames can be seen to enter them. Thus there is not only the intense heat at the tube ends, but cold water on the water side of the tube-sheet tending to keep it cool.

Another explanation for tube leakages was based upon the suggestion that possibly expansion or contraction of the various parts of the boiler has become more aggravated with the larger boiler, and in consequence a different method in construction is necessary. There are engines running out of St. Paul that are in as heavy service as any engines of their class in the country, and are working almost all the time at their maximum capacity. They are Schenectady engines with shallow fireboxes, and their flues are almost absolutely free from leakage. It is a rare thing that one of those engines fails on account of flue trouble. They are also remarkably free from staybolt leakage. Poor coal is also partly responsible for tube leakages. The poorer the coal, the more tube leakages.

It was stated that the rolling of a flue into a sheet is a water-tight job. This statement is based on an experiment made by Mr. Kinsell two or three years ago. He took a piece of boiler plate about $^{7}/_{16}$ in. thick, and rolled short pieces of flues into it every way he could think of—without ferrules, with ferrules, with iron and copper ferrules, and with and without beads. Then he put it into a spring furnace until it was cherry red; took it out and dropped it into water a large number of times. When this had been done it was scarcely possible to loosen those tubes with a hammer. This seems to show that the flue and sheet expanded and contracted together and stayed tight.

Experiments made by a master mechanics' committee a few years ago on boiler temperatures showed that there was a decidedly higher temperature around the top flues than there was at the bottom. In fact, they melted fusible metal at above the temperature of saturated water under the water line, and the indications were that there was no water around them, although it was probably only momentary. Now those flues with the water excluded from the sheet and less heat going into them gave the sheet an opportunity to expand and contract with them. Experience also seems to show that compound engines give less trouble with their flues than simple engines. Records that were kept for five years on the Great Western showed that the flues and side sheets would run 50 to 100 per cent. longer in compounds than they would in the same simple engines. This probably applies to any class of compounds against the same simples.

The difference was attributed to an even exhaust. A high official of an American railroad who has just returned from abroad was said to have been particularly impressed with the soft exhaust of foreign locomotives, particularly in France. He inquired the reason. Much is due to the use of variable exhaust nozzles and the absence of diaphragm plates in the smoke boxes. The methods employed by French and English railroads make it possible to give to each class of new locomotive as it is introduced on the road most careful attention as to the adjustment of the front end appliances. New designs of locomotives are not introduced so frequently as is common in this country. Each new design receives the personal attention of the motive power official in such a way that the first example of the new class is made perfect as to the adjustment of its front ends before others are built. Such methods enable foreign locomotive men to avoid the use of the diaphragm plate, which Dr. Goss showed in the *American Engineer* tests was responsible for one-third of the work of the exhaust jet. Variable exhaust nozzles have been repeatedly tried in American practice, but the device has never become common practice. The principal reason for this is the difficulty in training American engineers to use such a device properly. They do not even use the starting valve of compounds property, for compound starting valves are often found left open during an entire run. It is different in France, where locomotive engineers work under a system of premiums which involve fuel consumption, punctuality and other satisfactory service. French locomotive engineers are safely trusted with variable exhaust devices, and they use them and use them properly. In starting out from a station the nozzle is enlargd to save tearing the fire, and on the run the nozzle is adjusted to suit conditions. In case steam pressure runs down, it may usually be quickly restored with the nozzle; but if the nozzle is thus restricted it is done so with care because of its effect on the earnings of the men at the end of the month, through the consumption of more coal. There is a long history back of the good work of the French locomtive engineers, and one which would make a profitable study for those who appreciate the soft exhaust of their locomotives.

To apply this to American practice it would appear that where a 5-in. nozzle is required with poor coal on a heavy grade, with good coal it simply tears the fire to pieces and burns fuel uselessly. At the same time it is hard on the tubes and the fire, especially when pulling out of a station. Therefore it seems to be only a question of time when it will be necessary to use a variable nozzle in the front ends of American locomotives in order to properly regulate the exhaust. There should also be education of officials, teaching them that a man cannot stay out 25 hours and give good service. Human endurance has a limit, and 25 hours is far too long for any man to work.

The official in charge of the Austrian Railroads Ministry, Wrba, who had spent his life in the government service, has been retired, and in a new cabinet the Railroad Minister is Dr. von Derschatta, leader of the German Popular party in the Parliament. At the same time the head of the commercial department of the State Railroads became Minister of Commerce in that cabinet.

GENERAL NEWS SECTION

NOTES.

The United States Court in Utah has issued a permanent injunction forbidding the ticket brokers of Salt Lake and Ogden to deal in tickets of the Southern Pacific or the Denver & Rio Grande.

Ten young officers from the Japanese army are to take positions in offices of the Southern Pacific Railroad at San Francisco, Portland, Salt Lake, Los Angeles, New Orleans and Omaha, to study American railroad methods.

At Las Vegas, N. Mex., the Atchison, Topeka & Santa Fe Railway and the Colorado Fuel & Iron Company have been fined in the Federal court $15,000 each for violation of the Interstate Commerce law in making secret freight rates.

In a fire at St. Louis on July 12 the records in the general offices of the Missouri Pacific Railway were half destroyed by fire and water and by being pitched out into the street. The building, which is fireproof, was not seriously damaged.

It is reported in the newspapers, apparently on the authority of an officer of the road, that the Canada division of the Michigan Central, formerly the Canada Southern, has never killed a passenger during the 31 years that the line has been in operation.

Mr. W. A. Moyer, Industrial Agent of the Delaware & Hudson Railroad, has made arrangements with 10 farmers along the line of the railroad to experiment with crops which they have not heretofore raised, and he has already had planted a lot of alfalfa.

The yacht "Dixie," owned by a man in Galveston, Tex., has recently made a voyage from Bayonne, N. J., where it was built, through to Galveston, by way of the Hudson river, the Erie canal, the Great Lakes, the Chicago drainage canal, the Mississippi river, and the Gulf of Mexico.

In the case of a street car motorman in New York city arrested recently for causing the death of a pedestrian, Coroner Harburger required $5,000 bail; and he informed the New York City Railway Company that hereafter, in cases where a person is run over and killed by a street car, the motorman will be held without bail.

The Missouri, Kansas & Texas, the St. Louis Southwestern, and, it is said, several other roads, have filed or will file suits in the Federal Courts at Austin, Tex., to stop the enforcement of the reduced freight rates in that state recently ordered by the Railroad Commission. The railroads declare that the present rates are so low as to be confiscatory.

At Martinsville, N. Y., on the night of July 11 a train of two electric cars of the International Railway Company ran over a misplaced switch and collided with a standing train consisting of a motor and seven freight cars; and five passengers were killed outright. About 20 were injured, some of them fatally. The foremost passenger car was completely wrecked.

The "St. Louis Limited" express of the Pennsylvania Railroad, according to an advertisement in the daily newspapers, has arrived at St. Louis on time 344 times out of 365. This train leaves Jersey City at 2.14 p.m., eastern time, and is due at St. Louis the next day at 4.30 p.m., central time. The distance, as given in the *Official Guide*, is 1,064 miles, making the average rate of speed, through, 39 miles an hour.

One of the grain elevators of the Pennsylvania Railroad (Philadelphia, Baltimore & Washington) at Baltimore, has been equipped with a Hess pneumatic grain drier with a capacity from 18,000 to 25,000 bushels a day, and grain containing an excess of moisture can here be put in suitable condition for export. Corn which was graded as "steamer No. 1" has been run through the drier and so improved that its grade was raised so as to increase its value, with a loss of only 5 to 7 per cent. in quantity.

A press despatch from Pittsburg quoting statistics of the Pittsburg Car Service Association says that the freight movement in that territory during the month of June was 9 per cent. greater than in the same month of 1905, the number of cars moved being this year 317,715 and last year 291,895. These figures do not include 150,000 cars a month which are engaged in coal and coke traffic, not dealt with by the car service association. The Pittsburg association's territory takes in Wheeling, New Castle and Youngstown. Mr. Prall, Manager of the car service association, estimates that the tonnage of freight moved in the nine months ending with last December was about as large as that for the 12 months last preceding that period. The railroads in the Pittsburg district are now giving prompt freight service.

Eight Automobile Passengers Killed.

A press despatch from London, July 12, reports the wreck of a motor omnibus at Crawley, on the road to Brighton, in which eight passengers were killed and 20 badly injured, the omnibus being overturned. In consequence of the failure of the brakes the vehicle dashed at high speed down a hill and ran against a tree. The 34 passengers, mostly merchants of Orpington, were pitched out in all directions.

Mail Carrying on Chicago Underground Tunnels.

The Chicago Subway began this week carrying mail between the La Salle street station and the Federal building. Service between the post office and the Union Station will be opened shortly. It is expected that service to the North-Western and Illinois Central stations will be in operation within a month, and to the Dearborn street station by September 1st.

The Salisbury Disaster.

Press despatches of July 16 report that the inquest on the deaths of the 27 persons killed in the derailment at Salisbury, England, on the London & South Western, July 1, resulted in a verdict by the jury that the derailment was caused by excessive speed. At the hearing on the 16th the railroad company announced that it accepted full responsibility for all the legal consequences of the accident. The chief guard of the train testified that the train was running at high speed, probably 50 miles an hour, as it entered Salisbury station, and that he applied the brakes to warn the engineman. From Wilton to Salisbury, most of the way down grade, the speed was about 70 miles an hour. By an order issued in April, 1904, the speed of express trains through Salisbury was limited to 30 miles an hour, on account of the curve. It was testified that in February last an order was issued reducing this limit to 26 miles an hour, but later was withdrawn, from which it would seem that the 30-mile rule was re-established. Superintendent Holmes, of the railroad, expressed the opinion that this derailment was due to excessive speed. An officer of the road testified that the engineman was a teetotaller and perfectly competent to run an express train. The roadway and rolling stock were examined after the accident and no defect was found which would have caused the derailment.

Investigation of Railroads and Elevators.

Chairman Knapp, of the Interstate Commerce Commission, has sent to the principal railroads a request for information on which to base a report on the connection between railroads and grain elevators as called for by Senator La Follette's resolution, which was passed June 25. The information, under nine heads, is required by August 15. The different branches of the subject are, briefly—

(1) Name and location of every elevator and its capacity; and whether public or private.

(2) Name and address of party operating each elevator, and whether he is the owner.

(3) Whether or not elevators stand on the company's land; and, if so, whether this privilege is open to all.

(4) What interest has the road in any elevator or in its operation; what allowances are made to elevators for elevating or transferring grain?

(5) Names of ten largest grain shippers since June 30, 1905; and whether these shippers have an interest in elevators on the company's lines.

(6) Extent to which the road has bought or sold grain (by ownership in grain companies).

(7) Extent, so far as known, or readily ascertainable, to which any officer, director or employee is interested in elevators or the grain business; also the same information, so far as known, concerning stockholders.

(8) What allowances to shippers have been made during the last three years because of stress of competition; why did you grant these allowances? Did they depend upon the amount of grain shipped?

(9) Methods of distributing grain cars.

A Decision on Overhaul.

Ex-Judge Alton B. Parker sitting as referee rendered a judgment on July 17 against the Delaware & Hudson for $951,000 and costs in favor of the contracting firm of Sundstrom & Stratton, of

New York. The claim arose in the settlement of a contract for the reconstruction of the Chateaugay Railroad which the plaintiffs completed in 1904. The principal contest in the case was over the item of "overhauled material." There was a provision in the contract by which Sundstrom & Stratton were to receive a cent a yard extra for every yard of earth hauled for each 100 ft. over 3,000, no distinction being made between material hauled in standard gage cars or narrow gage cars. During the progress of the work the contractors hauled the material with standard gage cars. The Delaware & Hudson asserted that the contractors were not entitled to recover for the material hauled in the standard gage cars.

The Earthquake as a Road-Builder.

The Ocean Shore road, being built between San Francisco and Santa Cruz, is to run close to the ocean the entire distance. J. B. Rogers, the Chief Engineer, says that roadbed of the line, while damaged to some extent, was actually benefited in one place by the earthquake to the extent of about $15,000. Along Mussel Rock bluffs, the company was progressing nicely with the work of grading its roadbed, when the earthquake came along and accomplished in a few seconds what the company would have taken weeks and the expenditure of many thousands of dollars to accomplish. The bluffs in question were very precipitous, and in order to secure a roadbed for the electric line half-way up the bluffs it became necessary to remove thousands of yards of overhanging rock and earth; but the earthquake shook down an immense amount of material, and where a precipitous bluff stood before the earthquake is now a sloping hill that can be graded at comparatively little expense. This offsets probably half the damage which the road sustained in other places.—*Engineering and Mining Journal.*

A Prize Package for Every Passenger.

By printing a puff of the prunes purveyed to his patrons Mr. Daniels once increased the patronage of the New York Central dining cars 98 per cent. (or some other percentage), and now Mr. Eustis is trying to do the same trick with a potato. His advertisement says:

> It is no ordinary, every-day potato that the patron of the Burlington dining car gets. No, it's a potato of distinction—a potato with a pedigree and a special mission to perform. It was grown especially for the Burlington away out in the Big Horn Basin of Wyoming. A special leaflet has been printed. Inquiries may be addressed to—

And so on for two or three stickfuls. The peanuts of Virginia and the hash from the hotels of Hohokus have yet to make their mark as dining-car luxuries.

Freight Car Frauds.

Mr. J. W. Midgley, of Chicago, quotes from a letter from a railroad officer the following example of how foreign freight cars are misused:

"1. A detoured train of sixty-odd penalty cars delivered a few minutes before midnight and afterward returned by reason of an alleged engine failure.

"2. A paper delivery arranged, covering between 200 and 300 cars. This deal fell through, however, because a third party intervened.

"3. We have cars returning bearing cards: 'Load this car off the line'—the identity of the road placing the cards not being shown.

"4. Instructions are in the hands of many terminal agents to use penalty cars for transfer of merchandise and other switch business that will remove them temporarily from accounts.

"5. Instructions to load penalty cars to any road, in any direction, are in the hands of certain agents.

"6. By some roads it is considered legitimate to load penalty cars out of route, so long as the loading takes them in the general direction of the owning line."

Another officer raises these questions:

"While a large amount of diversion can undoubtedly be prevented by careful, conscientious work on the part of those in charge of the handling of foreign cars, a certain amount of diversions cannot be avoided without a large increase in expenses not commensurate with the object attained—and, what is worse, a detention in the movement which could not be tolerated or defended. For instance, at transfer stations cars arrive and depart on certain schedules of time. It is necessary to meet those schedules or block the transfer. Foreign cars will arrive loaded for miscellaneous points and the heaviest lading in the car will possibly take it out of route; yet if the transfer people should attempt to sort the lading to fit the car ownerships, it would require considerably more labor and more time, and cars would not make schedules, and in a short time the transfer would become blocked.

"Again, cars floated to piers must necessarily bring back lading from the piers, and if the destination of the return lading does not fit the car ownership, the cars will be diverted. The expense of avoiding such a contingency by transferring or providing proper foreign cars or system cars at the piers and returning empty such foreign cars as cannot be used at piers, with consequent delay to freight, would be considerably in excess of the object attained."

Railroads in the Southern States.

The most prosperous year in the history of railroads in the south and throughout the country closed with the fiscal year 1905-1906, on June 30. All previous records were broken, every railroad in the south having done a larger business during that period than any previous similar period. During 10 of the 12 months every car and locomotive on the railroads of the south were constantly in use with a demand far greater than the supply. During the first two months, July and August, 1905, business was very large but not taxing the capacity of the roads. Beginning with September and continuing up to the present, few of the railroads could have moved a greater volume of business than was offered them. Six months of the time the roads were unequal to the task, and the unsatisfied demand for cars was general. One result of such prosperity is that there is hardly a company but is arranging to build new lines and extensions.

The Illinois Central proposes building a line from Nashville to Jackson, Miss., connecting with the main line to New Orleans. The 'Frisco System proposes building from Baton Rouge, La., to Jackson, Birmingham and Nashville. The Mobile, Jackson & Kansas City will extend its line to Jackson, Tenn. The Atlanta, Birmingham & Atlantic is now building two lines into Atlanta and one to Birmingham. This company also proposes building over the right-of-way of the Nashville & Huntsville to Nashville. The Southern is building from Stevenson, Ala., to Chattanooga, 40 miles, and is building another important line from Walland, Tenn., to Anderson, S. C., forming a more direct line to Charleston and Savannah for its lines in Tennessee and Kentucky. Besides these the Southern will build a score of small branch lines. Other southern roads are practically certain to build short lines aggregating 400 miles of new track. In the past few months a number of new companies have been organized to build roads in the south. Several of these projects will probably be carried out.

Another encouraging feature is the building of second track by a number of the most important trunk lines. The Illinois Central is pushing its double-track work to New Orleans. The Louisville & Nashville is preparing to build the second track from Gallatin, Tenn., just north of Nashville, to Birmingham. The Southern has begun laying second track from Chattanooga through Knoxville to Morristown, Tenn. On a number of other divisions some double-track work will also be done. In Texas and Louisiana railroads are building in almost every direction. The Colorado Southern, New Orleans & Pacific, controlled by the 'Frisco, is being rapidly constructed from Baton Rouge to De Quincy, where it connects with the Kansas City Southern to Beaumont. The St. Louis, Brownsville & Mexico is nearing completion from Brownsville to Houston, where the Baton Rouge line will connect with it over the Beaumont, Sour Lake & Western. Mr. Yoakum is also building toward Dallas and Fort Worth to connect his southwestern lines with the Rock Island and the 'Frisco proper. The St. Louis Southwestern is building from near Shreveport to Beaumont, Houston and Galveston. The Santa Fe is building from near Beaumont through Louisiana to New Orleans. Not less than 20 other lines are building through Texas, and as many are projected in the three states of Louisiana, Arkansas and Oklahoma.—*The Tradesman.*

TRADE CATALOGUES.

Scales.—The Buda Foundry & Manufacturing Co., Chicago, describes its U. S. standard scales in its latest publication. These include railroad track scales, coal hopper scales, depot scales, stock scales, wagon scales and portable scales. Each of these is suitably described and illustrated and prices given for the various styles and capacities. Sheets and lists of repair parts of the track scales and of the wagon stock and depot scales are also given. The book is attractively gotten up, being printed in two colors and illustrated with excellent half-tones.

"A Colorado Summer."—This is the title of a folder recently issued by the Atchison, Topeka & Santa Fe. Its beautifully illustrated and interesting description of the state is a strong argument in favor of the passenger department's advice to "go to Colorado" if in doubt as to where to spend a vacation.

Blue-Print Machine.—The Revolute Machine Co., New York, sends a folder describing the Everett-McAdam continuous electric blue-print machine. Mercury vapor lamps are used and the paper is fed from rolls to the inside of the cylinder in which the printing is done.

Forging.—The Solid Steel Tool & Forge Co., Brackenridge, Pa., is distributing an "Index" or complete list of the kinds of forgings and tools the company makes.

Manufacturing and Business.

The Union Switch & Signal Co. has received orders for signal apparatus from the Nippon and the Kobe Railroads of Japan.

The Chicago Car Heating Co. on July 1st opened an eastern office at 170 Broadway, New York, with F. F. Coggin and B. A. Keeler in charge.

David O. Holbrook, who until recently was Vice-President of the Pennsylvania Malleable Co. and the Central Car Wheel Co., has been elected Vice-President of the Dayton Pneumatic Tool Co., Pittsburg, Pa.

The Dayton Pneumatic Tool Co., Dayton, Ohio, which suffered a small loss from fire on July 2 and closed down the plant temporarily until the power plant could be repaired, resumed full operations on the 6th. The only loss from the fire was in belting, line shafting and some miscellaneous office supplies which were stored in the portion of the building where the fire occurred.

The American Car & Equipment Co., 936 Monadnock Building, Chicago, has been incorporated to buy, sell, repair, rebuild and construct cars and locomotives and handle a general line of railroad supplies. The officers are: I. J. Kusel, President; C. R. Powell, Vice-President and Secretary; H. C. Smyth, Treasurer. Mr. Kusel was for a number of years connected with the electrical trade and was President of the Eureka Electric Co. Mr. Powell was for many years with the Illinois Central R. R., holding various positions in the mechanical department. Mr. Smyth will give attention to the financial interests of the company.

In an article on the "Abuse of Valves," published in *The Valve World*, R. T. Crane, President of the Crane Co., Chicago, says that in 95 cases out of 100 leaky valves are due to abuse and carelessness on the part of the men who install them, rather than to defects in the valves themselves. If the few simple directions given by Mr. Crane for the installation and care of valves were generally followed much of the annoyance and expense due to leaky valves would be avoided. The article has been reprinted in the form of a poster suitable for hanging on the walls of engine rooms and shops, and all users of valves may obtain one or more copies free by writing the Crane Co. The posters are legibly printed in two colors on heavy calendered bristol-board.

Iron and Steel.

The Lehigh Valley has ordered 12,000 tons of rails and the Chicago, Burlington & Quincy 10,000 tons.

The Baltimore & Ohio has given a contract to the American Bridge Co. for an additional 1,100 tons of bridge material, and the Northern Pacific to the same company for 1,000 tons; the Pennsylvania, 1,500 tons; the Chicago, Milwaukee & St. Paul, 400 tons, and the Lake Shore & Michigan Southern, 350 tons. The Southern Pacific Company has ordered 50,000 tons of rails from Spain for the Cananea, Yaqui River & Pacific. These rails are to be shipped from Bilbao via Cape Horn to Guaymas, in the state of Sonora, Mexico.

OBITUARY NOTICES.

Robert B. Burns, Chief Engineer of the Atchison, Topeka & Santa Fe Coast Lines, died recently at Los Angeles, Cal. Mr. Burns was born in 1852 and graduated from the University of Maine in 1877. He began railroad work as a draftsman on the Northern Pacific in 1879. From 1881 to 1884 he was in the engineering department of the Mexican Central. He then, for two years, was engaged in private practice as a consulting engineer, after which he went to the Colorado Midland as Bridge Engineer on construction. In 1889 he was appointed Engineer of Maintenance of Way of the Atlantic & Pacific, now part of the Atchison, Topeka & Santa Fe Coast Lines. In 1892 he was appointed Resident Engineer in charge of Maintenance, and in 1896 Chief Engineer in charge of Maintenance. The next year he was appointed Chief Engineer of the Santa Fe Pacific, the name of the new operating company of the Atlantic & Pacific, and, in 1900, he was appointed also Chief Engineer of the other two roads comprising the A., T. & S. F. Coast Lines.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)

International Railroad Master Blacksmiths' Association.

The fourteenth annual convention of this association will meet at the Sherman House, Chicago, Ill., August 21-23. The subjects to be discussed at this meeting, with names of chairmen, are: Frogs and Crossings, S. Uren; Flue Welding, G. H. Judy; Classification of Work in Shop, W. J. Mayer; Tools and Formers for Bulldozers, Steam Hammers and Forging Machines, Thos. F. Keane; Discipline in a Blacksmith Shop, A. W. McCaslin; Case Hardening Methods, G. F. Hinkins; Annealing and Tempering High-Speed Steel, Geo. Lindsay; Best Coal and Best Kind of Fires, John Buckley; Subjects for 1907 Meeting, G. H. Judy; Piece Work vs. Day Work, R. A. Mould; Locomotive Frames—From Scrap to Finish, Also Repairing, Jas. Fenwick; Thermit Welding and Cast, Geo. Kelly.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Butte, Anaconda & Pacific.—J. D. Ryan has been elected President, with office at Butte, Mont.

Coahuila & Zacatecas.—E. C. Farrel has been appointed Auditor, with office at Saltillo, Mex., succeeding H. F. Horton, resigned.

Illinois Terminal.—G. M. Levis, Vice-President, has been elected President, succeeding W. E. Smith. H. S. Baker, General Counsel, has been elected also Secretary, succeeding Charles Levis, and L. A. Schaffy has been elected Treasurer, succeeding R. H. Levis. L. T. Castle has been appointed Auditor, succeeding F. L. Taylor.

Kentucky Valley.—The officers of this company are: I. H. Wheatcroft, President and General Manager, with office at Providence, Ky.; B. J. Arnold, Vice-President, with office at Chicago, Ill., and E. C. Ruff, Secretary and Auditor, with office at Providence.

New Orleans Terminal.—J. S. Powell has been appointed Acting Assistant Auditor, with office at New Orleans, La., succeeding C. A. Carroll.

Operating Officers.

Atchison, Topeka & Santa Fe (Coast Lines).—R. H. Tuttle, trainmaster at Needles, Cal., has been appointed Acting Superintendent at that place, during the three months' leave of absence of John Denair.

Atlantic Coast Line.—W. R. Beauprie, Superintendent at Montgomery, Ala., has resigned. S. B. Bennett, Superintendent at Waycross, Ga., succeeds Mr. Beauprie. R. A. McCranie, Superintendent at Jacksonville, Fla., succeeds Mr. Bennett.

Chicago, Lake Shore & Eastern.—A. N. McClary has been appointed Car Accountant, with office at Joliet, Ill., succeeding O. F. Clark.

Chicago, Rock Island & Gulf.—J. R. Blakeney has been appointed Car Accountant, with office at Forth Worth, Tex., succeeding J. W. Thompson, resigned.

Corvallis & Eastern.—G. W. Talbot has been appointed General Manager. J. T. Walsh has been appointed Acting Superintendent, succeeding C. Sullivan.

Illinois Terminal.—H. H. Ferguson, General Manager, has been elected also Vice-President.

International & Great Northern.—H. S. Corrington has been appointed Assistant Superintendent at Taylor, Tex.

Interoceanic of Mexico.—See National R. R. of Mexico.

Kansas City Southern.—E. E. Gibson has been appointed Superintendent of Terminals at Port Arthur, Tex.

National R. R. of Mexico.—The authority of H. H. Allison, Superintendent of Terminals at Mexico City, has been extended over the terminals at that place of the Interoceanic of Mexico.

Southern.—The lines east and south of Harriman Junction, Chattanooga, Nashville and Memphis, are now operated in four districts instead of two. E. H. Coapman has been appointed Assistant General Superintendent in charge of the Northern district, consisting of the Washington, Danville and Norfolk divisions, with office at Danville, Va. J. N. Seale has been appointed Assistant General Superintendent in charge of the Eastern district, consisting of the Charlotte, Columbia, Charleston and Jacksonville divisions, with office at Charlotte, N. C.; W. N. Foreacre has been appointed Assistant General Superintendent in charge of the Western district, consisting of the Birmingham, Memphis and Mobile Divisions, with office at Birmingham, Ala.; G. R. Loyall has been appointed Assistant General Superintendent in charge of the Middle district, consisting of the Asheville, Knoxville, Nashville and Atlanta divisions, with office at Knoxville, Tenn.; G. W. Taylor has been appointed Superintendent of Transportation, with office at Washington, succeeding J. N. Seale, promoted. E. E. Norris has been appointed Assistant Superintendent of the coal lines, Knoxville division, with office at Knoxville, Tenn.

Tonopah & Goldfield.—J. F. Hedden has been appointed General Superintendent and General Freight and Passenger Agent, with office at Tonopah, Nev., succeeding Alonzo Tripp, resigned.

Vandalia.—The office of F. H. Worthington, Superintendent of the

Peoria division, has been removed from Terre Haute, Ind., to Decatur, Ill.

Traffic Officers.

Alabama & Vicksburg.—See New Orleans & Northeastern.

Central of Georgia.—J. L. Graham, Assistant General Freight Agent, has resigned to go into other business.

Chicago & Eastern Illinois.—S. J. Cooke, General Freight Agent, has resigned, effective August 1.

Chicago, St. Paul, Minneapolis & Omaha.—E. A. Gray has been appointed Assistant General Freight Agent at St. Paul, Minn. F. C. Gifford has been appointed Assistant General Freight Agent at Minneapolis, Minn.

Great Northern.—A. L. Craig, who was recently appointed Passenger Traffic Manager, was born at St. Paul, Minn., in 1861. He began railroad service in 1880 as a roadman on construction work on the Northern Pacific. For the next seven years he was in the office of the Auditor of that road and was then appointed chief rate clerk in the office of the General Passenger and Ticket Agent. He was made Assistant General Ticket Agent in 1891 and, in 1900, was appointed Assistant General Passenger and Ticket Agent. The next year he went to the Oregon R. R. & Navigation as General Passenger Agent; and now comes from that road to the Great Northern.

A. L. Craig.

S. G. Yerkes, Assistant General Passenger Agent, has been appointed General Passenger Agent, with office at St. Paul, Minn., succeeding C. E. Stone, resigned.

New Orleans & Northeastern.—W. H. Quigg, Second Assistant General Freight Agent of this road and of the Alabama & Vicksburg, and the Vicksburg, Shreveport & Pacific, has been appointed First Assistant General Freight Agent of the three companies, succeeding J. D. Grant, resigned to go into other business.

Vicksburg, Shreveport & Pacific.—See New Orleans & Northeastern.

Engineering and Rolling Stock Officers.

Chicago & North-Western.—W. J. Towne, Engineer of Permanent Improvements, has been appointed Engineer of Maintenance of the lines east of the Missouri river. A. A. Schenck, Division Engineer at Omaha, Neb., has been appointed Engineer of Maintenance of the lines west of the Missouri river. Hereafter, division engineers will report to the engineers of maintenance on all matters heretofore referred to the Chief Engineer. The Engineers of Maintenance will report to the General Manager on Maintenance of tracks, buildings, water stations and other operating facilities, and to the Chief Engineer on matters relating to bridges and drainage.

E. B. Thompson, Master Mechanic at Winona, Minn., has been appointed to the new office of Second Assistant Superintendent of Motive Power and Machinery, with office at Chicago, Ill.

Chicago, Rock Island & Gulf.—J. H. Farmer has been appointed Master Mechanic of the Mexican division, with office at Delhart, Tex., succeeding E. D. Andrews, resigned.

Chicago, Rock Island & Pacific.—E. F. Tegtmeyer, Foreman of the Fort Wayne, Ind., erecting shops of the Pennsylvania Lines West, has been appointed Assistant Superintendent of the C., R. I. & P. shops at East Moline, Ill.

Coahuila & Zacatecas.—W. F. Hannes has been appointed Consulting Engineer, succeeding H. Scholfield, resigned.

Coal & Coke.—D. C. Courtney has been appointed Superintendent of Motive Power, succeeding C. E. Turner, resigned.

National R. R. of Mexico.—James Farrel, Acting Superintendent of Motive Power and Machinery, has been appointed Superintendent of Motive Power and Machinery, with office at Laredo, Tex.

Parral & Durango.—G. S. Davis, Engineer, has been appointed Chief Engineer, with office at Mesa de Sandia, Mex.

Pennsylvania Lines West.—H. E. Newcomet, Engineer of Maintenance of Way at New Castle, Pa., has been appointed Acting Engineer of Maintenance of Way at Cleveland, Ohio, during the absence of H. E. Culbertson, who has been given a leave of absence for several months on account of ill health.

Philadelphia & Reading.—J. B. Young has been appointed Chemist, succeeding Robert Job, resigned. Mr. Young will report to the Superintendent of Motive Power and Rolling Equipment.

Southern.—The office of Thomas Bernard, Engineer of Maintenance of Way, has been removed from Greensboro, N. C., to Danville, Va.

Purchasing Agents.

Chicago Great Western.—V. T. DeVinny has been appointed Acting Purchasing Agent, succeeding A. D. Ward, resigned to go into other business.

Norfolk & Southern.—W. R. Burrows has been appointed Purchasing Agent, with office at Norfolk, Va., succeeding, as Purchasing Agent, M. K. King, who remains Vice-President and General Manager.

Special Officers.

Temiskaming & Northern Ontario.—A. A. Cole has been appointed Mining Engineer, with supervision over the cobalt and silver mines under the control of the T. & N. Railway Commission.

LOCOMOTIVE BUILDING.

The Buffalo, Attica & Arcade has ordered two locomotives from the Baldwin Works.

The Missouri River & Northwestern, it is reported, is in the market for locomotives.

The Louisville & Nashville, it is reported, is in the market for material for locomotive tender tanks.

The Canadian Northern has ordered 15 ten-wheel locomotives from the Canadian Locomotive Co., for 1907 delivery.

The Lima Locomotive & Machine Company report the following orders during the past week for Shay locomotives: Sibley Quarry Co., Sibley, Mich., one 18-ton locomotive; C. R. Johnson, Norfolk, Va., one 24-ton locomotive; Victoria Lumber & Mfg. Co., Victoria, B. C., two 45-ton locomotives; England Walton Co., Ltd., Philadelphia, Pa., one 18-ton and one 24-ton locomotive; Superviele & Co., Las Predras, Uruguay, S. A., one 10-ton locomotive; Gibson, Battle & Co., Sydney, Australia, one 65-ton locomotive, and T. M. O'Connell, Rainer, Ore., one 37-ton locomotive.

CAR BUILDING.

The Kiushu of Japan has just ordered five Pullman cars from the Pullman Co.

The Southern, it is reported, is considering the building of several hospital cars.

The Baltimore & Ohio, it is reported, is converting a number of its old box cars into flat cars.

The Lehigh Valley, it is reported, has ordered 1,000 steel hopper cars from the Standard Steel Car Co. and 500 gondola cars from the Cambria Steel Co.

The Marcellus & Otisco Lake is in the market for one passenger coach equipped with Baker heater. Address R. L. Scott, Superintendent, Marcellus, N. Y.

The Norfolk & Western has ordered nine postal cars from the Pullman Co., for October delivery. The specifications for these cars were published in our issue of May 25.

The New Jersey & Hudson River Railway & Ferry Co. has ordered eight closed cars with bodies 42 ft. long and a seating capacity of 44 persons, from the John Stephenson Co. These cars will be equipped with G. E. motors and M. C. B. trucks.

The Los Angeles Railway Co. has ordered 100 standard combination cars from the St. Louis Car Co. The cars will weigh 23,000 lbs. and measure 39 ft. 6½ in. long, 8 ft. 5½ in. wide and 9 ft. 1 in. high, over all. The special equipment includes Sherwin-Williams Co.'s paint.

The Mineral Range, as reported in our issue of July 13, has

ordered 60 hopper bottom gondola cars of 80,000 lbs. capacity from the American Car & Foundry Co. These cars will weigh 32,000 lbs. and will measure 30 ft. long, 8 ft. 10 in. wide and 8 ft. 4 in. high, all outside measurements. The special equipment will include Common Sense bolsters, Monarch brake-beams, Congdon brake-shoes, Westinghouse brakes, National Fulton brasses, Trojan couplers, Gould draft rigging, Symington journal boxes, Railway Steel Spring Co.'s springs, Diamond trucks and American Car & Fdy. Co.'s wheels.

The Erie, as reported in our issue of July 13, has ordered 500 flat cars of 100,000 lbs. capacity for December, 1906, delivery, and 500 flat bottom drop end gondola cars of 100,000 lbs. capacity for January, 1907, delivery, from the Standard Steel Car Co., and 500 steel underframe produce cars of 80,000 lbs. capacity for November and December delivery from the American Car & Fdy. Co. The flat cars will weigh 33,000 lbs. and will measure 40 ft. 9 in. long by 9 ft. 6 in. wide. The bodies and underframes will be of metal. The gondola cars will weigh 42,600 lbs. and will measure 45 ft. long by 9 ft. 6 in. wide. The sides and ends will be of wood and the underframes will be of steel. The produce cars will measure 37 ft. 11 in. long by 9 ft. 2 in. wide. The bodies will be of wood and the underframes will be of steel. The special equipment will include steel axles, built up bolsters, Simplex brake-beams for produce and flat cars and Damascus brake-beams for gondola cars, Congdon brake-shoes, Climax brasses, Gould couplers for flat cars, R. E. Janney couplers for gondola cars and Major couplers for produce cars, Minor tandem draft rigging, Wood dust guards, Erie malleable iron journal boxes, archbar Barber roller trucks, and M. C. B. standard wheels for gondola and flat cars, and American Car & Fdy. Co.'s wheels for produce cars.

RAILROAD STRUCTURES.

ALBANY, N. Y.—The State Canal Board has made an agreement with the New York Central to pay that company $72,954 compensation for crossing the railroad company's line on the Niagara Falls branch near Rochester. The railroad agrees to build and maintain a steel bridge at the crossing.

BEAVER CITY, NEB.—Bids are wanted August 6 by the board of county commissioners of Furnas county for the construction of new steel bridges as follows: One 300-ft. bridge at Oxford, one 32-ft. steel span, 3 miles northwest of Cambridge, and one 34-ft. span, 8 miles southwest of Beaver City. A. R. Perry, County Clerk.

BIRMINGHAM, ALA.—A building permit has been issued by this city for the new union passenger station.

DAYTON, OHIO.—The commissioners have granted permission to the Cincinnati Northern Traction Co. to build two canal bridges, one at Alexandersville and the other at West Carrollton.

CHATTANOOGA, TENN.—According to local reports, the Chattanooga Electric Railway will put up car repair shops, to cost $125,000.

ELYRIA, OHIO.—The Lorain & West Virginia Railroad will build a bridge in Amherst Township and will also build a large number of overhead structures for highways in this county.

FORT WORTH, TEX.—The Fort Worth & Denver City Terminal Co. will soon start work on a new brick passenger station on East Ninth street.

GREENSBURG, PA.—Bids are wanted July 19 by John D. Hitchman, Controller, for putting up a three-span steel bridge over the Youghiogheny river in Westmoreland County.

HOUSTON, TEX.—The St. Louis, Brownsville & Mexico, it is said, has completed arrangements to build about six steel bridges along the line of its road.

MACON, GA.—Definite announcement has been made that the Central of Georgia will build shops on the land recently bought from this city.

MINNEAPOLIS, MINN.—The Northern Pacific and the M., St. P. & S. S. M., according to local reports, are making large purchases of land for new yards and terminal facilities. The Northern Pacific has bought 180 acres in southeast Minneapolis. The Great Northern has filled in a large tract of marshy land in the Cedar Lake suburban district of Minneapolis as a site for grain elevators, shops and roundhouses.

MONTGOMERY, ALA.—The Western of Alabama is to make improvements to include a new shop building 75 ft. by 500 ft., to cost about $80,000.

NEW ALBANY, IND.—The Chicago, Indianapolis & Louisville, it is said, has decided to put up a new brick, 16-stall roundhouse to cost $25,000.

RICHMOND, VA.—The Chesapeake & Ohio has bought land along Seventeenth street as a site for a large freight station.

RED DEER, ALB.—Contract has been given to Thorald & Pardis, of Calgary, for putting up a six-stall roundhouse for the Canadian Pacific.

SAN FRANCISCO, CAL.—The Southern Pacific, which recently leased the James Flood building for its general offices, employing about 1,500 persons, has given a contract, at about $80,000, for remodeling the interior of the building, the work to be completed during the present year. The ticket offices of the Southern Pacific and a number of the trans-continental lines which formerly had offices in the Palace and Grand Hotels, will be on the ground floor of the Floid building.

SCRANTON, PA.—The Delaware, Lackawanna & Western, it is said, is having plans made for building a viaduct at Clark's Summit.

SOURIS, MAN.—Contracts have been let to J. McDiarmid Bros., of Winnipeg, for putting up a six-stall roundhouse and engine room at this place for the Canadian Pacific; also for putting up a roundhouse at Lethbridge for the same company.

TORONTO, ONT.—Mayor J. Coatsworth states that bids for building the combined railroad and highway bridge at Yonge street will be called for as soon a the legal arrangements can be completed.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ALTON, CALHOUN & QUINCY.—Incorporated in Illinois with $5,000 capital, with C. L. Wood, M. C. Johnson, J. J. Kinder, B. T. Douglas, G. W. Douglas, J. R. Vaughn and John Early as directors. The company proposes to build a line from Alton west to Grafton and Brussels, thence north via Batchtown, Hamburg and Pleasant Hill to Quincy, Ill., approximately 100 miles.

ANDERSON TRACTION COMPANY.—This company is building the first section of an electric line from Anderson, S. C., to Belton, 10 miles, and proposes eventually to extend the line to Greenville, S. C., 35 miles. The capital stock of the company is $280,000. J. A. Brock, of Anderson, is President.

ATCHISON, TOPEKA & SANTA FE.—The Denver, Enid & Gulf, controlled by this company, has been incorporated in Kansas, with $3,000,000 capital, to build from the northern terminus of the present road of that name at Kiowa, northwest to a connection with the Englewood branch of the A., T. & S. F. The principal office will be at Topeka. Joseph Young, of Enid, is President, and J. E. Hurley, General Manager of the Santa Fe, is Vice-President. A contract is reported let to Barney Barkley for track laying on this extension from Kiowa, Kan., north as far as Medicine Lodge, about 20 miles, the work to be completed by September 1st.

ATLANTA & NEW ORLEANS.—This company, which has planned to build a line from Atlanta to New Orleans and Baton Rouge, La., has applied for a charter in Georgia. The proposed capital is $100,000, and the principal office at Atlanta. Ronald Ranson, H. S. Collinsworth, F. M. Merkell, W. N. Hawkes, F. M. Butt, J. S. Middletown and others are interested.

ATLANTIC & WESTERN.—See Atlantic Coast Line.

ATLANTIC COAST LINE.—This company having recently bought the Macon, Dublin & Savannah, which runs from Macon, Ga., to Vidalia, 92 miles, is planning to build a connecting link which will give it a through line from Macon to Savannah. This is to be done under the charter of a new company, the Atlantic & Western, which it to run from Vidalia, Toombs County, to a connection with the Atlantic Coast Line in Liberty County.

BIG HORN.—See Chicago, Burlington & Quincy.

CALIENTE & PIOCHE.—Incorporated in Utah with $300,000 capital to build a line from the Nevada-Utah Mines & Smelters Company at Pioche, Nev., south to the San Pedro, Los Angeles & Salt Lake at Caliente. The road will be 30 miles long and cost about $300,000. The officers and directors are: J. Ross Clark, President; W. H. Bancroft, Vice-President; E. Backingham, C. O. Wittemore, Pennel Cherington and F. H. Knickerbocker.

CANADIAN NORTHERN.—A contract is reported let to J. Y. Schell, M. P. for Glengarry, for building the proposed new line along the Ottawa river from Hawksbury, Ont., west through Ottawa, approximately 55 miles. (May 11, p. 142.)

The Prince Albert division of this road has been opened for business from Melfort, Sask., west to Prince Albert, 62.4 miles.

CANADIAN PACIFIC.—This company, it is said, will build a cut-

off at the Terrebonne Loop, on its Montreal and Quebec line, reducing the distance between these two points to 160 miles.

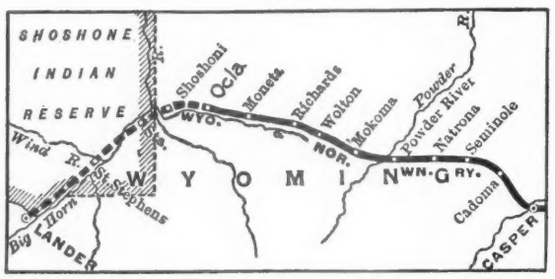
A contract, it is said, has been given to A. Cazier, of Cardstown, Alb., at about $200,000, for improving the roadbed near Maple Creek, Alb.

Central of Georgia.—This company has incorporated the Georgia Central & Gulf to build a line from Albany, Ga., via Quincy, Fla., to Apalachicola, approximately 160 miles. Such a line will give the Central a line from Atlanta via Macon and Albany to the Gulf of Mexico. Construction work is to be started shortly. J. T. Hanson, A. R. Lawton, W. A. Winburn and T. M. Cunningham, all of the Central of Georgia, are interested in the new company.

Chesapeake & Ohio.—The Piney Creek branch of the Hinton division has been extended from Surveyor, W. Va., to Lester, 3.2 miles.

The new Laurel Creek branch has been opened for business from Quinnimont, W. Va., to Hemlock Hollow, 5.5 miles.

Chicago & North-Western.—The Wyoming & North-Western has been extended from Wolton, Wyo., as far west as Ocla, 30.3 miles



Chicago & North-Western Extension in Wyoming.

from Wolton. Work on the remaining 60 miles to Lander is being pushed to completion. (June 29, p. 188.)

Chicago, Burlington & Quincy.—A contract has been given to the Walsh & Johnson Construction Co., of Davenport, Iowa, by this company, and work is already under way for reconstructing part of the line from Lynn, Ill., north about four miles to Orion; also from Rio north to Alpha, an additional five miles. The work includes grade reduction and change of line.

This company has opened the new Big Horn line from Frannie, Wyo., southeast to Worland, 82 miles. (June 29, p. 189.)

Consolidated Railway (N. Y., N. H. & H.).—President Mellen, of the New York, New Haven & Hartford, which controls the Consolidated electric lines, in a communication to the Massachusetts State Legislature says that the Consolidated Railway is to furnish the capital for building the Bennington & North Adams Street Railway. The Berkshire Street Railway has agreed to build an extension from Great Barrington to the Connecticut state line at or near Canaan either via South Egremont or direct from Great Barrington to Sheffield. The Consolidated is surveying for a line from the Massachusetts state line from near Canaan through Hartsville to Monterey, connecting with the Berkshire Street Railway; also for a connection between the Western Massachusetts at Huntington and the Berkshire Street Railway at Lee, Mass. Surveys are also to be made from Lee through the valley of the Farmington river to the Connecticut line near New Hartford, Conn. The company is also building an extension of the Springfield & Eastern from Monson to Fiskdale, about 12 miles, to connect the Springfield and the Worcester systems; and an extension is to be built to South Monson about one-half mile.

Cross Creek.—See Wabash.

Cuba Roads.—The President of the Republic has directed that bids be asked for building the 12 branch lines, for which the Cuban Parliament recently passed a bill granting subsidies of $6,000 a kilometer. This action would seem to defeat the plan to give the whole benefit of the subsidies to the Van Horne railroad system.

DeKalb, Sycamore & Interurban Traction.—Incorporated in Illinois with $100,000 capital to build an electric line from Belvidere south via DeKalb to Yorkville; also from Sycamore east to Elgin, with branches into the counties of Boon, McHenry, Kane, Ogle, Lee, Kendall, La Salle and Du Page. The names of the incorporators are not given.

Denver & Omaha Short Line.—Russell Harding, former Vice-President of the Cincinnati, Hamilton & Dayton, and of the Missouri Pacific, has taken active charge of the plans for the construction of a new line between Omaha and Denver. Mr. Harding is associated with H. B. Hollins & Co., who have undertaken to arrange the financing of the new line. (See Omaha & Denver Short Line, July 6, p. 5.)

Denver, Enid & Gulf.—See Atchison, Topeka & Santa Fe.

Eldorado, Marion & Southwestern.—Incorporated in Illinois to build a line from Eldorado southwest through Saline, Williamson, Johnson, Union and Alexander Counties to the Mississippi river, about 80 miles. The directors and incorporators are: John Collp and Chas. E. Owen, of Carterville; C. Agent, of Marion, and S. T. Brush, of Warbondale.

Fort Dodge, Des Moines & Southern.—With the proceeds of bonds sold to the Old Colony Trust Co., of Boston, the proposed electric line from Fort Dodge, Iowa, southeast via Ames to Des Moines, about 75 miles, is to be built at once. The right of way has been secured. The F. D., D. M. & S. is to take over the Fort Dodge and Ames electric lines.

Georgia & Florida.—This company has been granted a charter in Georgia, with $1,000,000 capital and with principal office at Augusta. The company proposes to build a line from Augusta, Ga., which, with several existing roads, will make a continuous line to the Gulf of Mexico, approximately 350 miles. Mindendorf-Williams & Co., of Baltimore, are said to be financing the project. (June 1, p. 161.)

Georgia Central & Gulf.—See Central of Georgia.

Georgia, Florida & Alabama.—Application has been made by this company for authority to amend its charter so as to build two branch lines, one from Cuthbert, Ga., to the Chattahooche river, and the other from the main line at Colquitt, Ga., to Eufala, Ala.

Granite City & East St. Louis Terminal.—Incorporated in Illinois, with $100,000 capital, with office in Chicago, to build a line from Granite City to East St. Louis. The incorporators and directors are: Charles G. Lucas, P. A. Nueffer, H. H. Phillips, H. B. Herd and R. M. Cole.

Gray's Harbor & Columbia River.—Incorporated in Washington with $1,000,000 capital and office at Tacoma. This company proposes to build a line from Kalama in Cowlitz County, Wash., on the Northern Pacific northwest through Wahkiakum and Pacific Counties to a point on the Pacific coast, about 80 miles, with a connecting line north to Gray's Harbor, an additional 40 miles. The company is also to operate steamers on the Pacific ocean and on the Columbia river. A. F. Albertson and C. Thorn, of Tacoma, and F. A. Rice, H. H. Scales and others, are interested.

Hamilton, Waterloo & Guelph (Electric).—Bids are wanted July 27 for building an electric line for this company from Hamilton, Ont., west to Galt; also from Hamilton northwest to Guelph, approximately 60 miles. Plans at the office of Thomas E. Hillman, C.E., Hamilton Provident Loan Building, Hamilton, Canada, to whom all bids should be addressed. (April 13, p. 115.)

Hancock & East Branch.—Incorporated in New York with $200,000 capital by F. V. Wishart, F. J. Mann and E. J. Welch, of New York City, to build a line from the Delaware & Eastern road near East Branch, N. Y., to Hancock, on the Erie and the New York, Ontario & Western, approximately 20 miles.

Hillsboro, Kimmswick & Northern.—Incorporated in Missouri with $300,000 capital and office in St. Louis. The company is to build a line from Hillsboro, in Jefferson County, northeast to the southern limits of St. Louis, about 23 miles. The stockholders are: H. W. Gulke, A. F. Furrer, Lee A. Hall, Charles A. Gulke and James J. Ring, all of St. Louis.

Houston & Texas Central.—This company announces that the Mexia-Nelleva cut-off was opened for traffic between Mexia and Jewett on July 15, and will be operated as a part of the first division. The new line extends from Mexia, Texas, southeast via Mexia Junction, Varela, Personville and Farrar to Jewett, on the International & Great Northern, 27.96 miles.

Indiana Union Traction.—In consideration of privileges granted by the city of Anderson, Ind., this company agrees to build by July, 1907, shops at that place to cost $125,000; and to extend its lines from that city southeast via Middletown to New Castle, about 20 miles; also from Anderson northwest to Elwood, an additional 15 miles, all by 1909.

Kansas City Terminal Co.—This company has been incorporated in Missouri with a capital of $30,000,000. The directors are as follows: B. L. Winchell, Rock Island; J. W. Kendrick, A., T. & S. F.; A. J. Earling, C., M. & St. Paul; S. M. Felton, Chicago & Alton; W. B. Scott, Union Pacific; F. A. Delano, Wabash; C. S. Clarke, Missouri Pacific; A. J. Davidson, St. L. & S. F.; A. A. Allen, M., K. & T.; D. Willard, C., B. & Q.; John M. Egan, Kansas City. The corporation is to build the new Union Passenger Station at Kansas City and construct and operate all the lines connected with

it. The present union station is operated by the Union Depot Co., of Kansas City.

LA GLORIA TRANSPORTATION COMPANY.—Incorporated in New Jersey, with $25,000 capital, to build railroads and operate steamers from Nuevitas, Cuba, northwest about 35 miles to La Gloria in the Province of Camaguey. The principal office of the company is at 167 Main avenue, Passaic, N. J., where Richard Atwater is in charge. The incorporators are: Louis T. Wilson, of Elizabeth; F. H. Ridgway and F. W. Frost, of New York.

MACON, DUBLIN & SAVANNAH.—See Atlantic Coast Line.

MARLBORO & DEEPWATER.—Incorporated in South Carolina with $25,000 capital to build 12 miles of railroad in that state. J. J. Matheson is President; G. D. Matheson, Vice-President, and C. R. May, Secretary and Treasurer.

MEXICAN ROADS.—A company, it is said, is being organized by A. W. Geist, who is a large mine operator, to build a line from Laspenas, on the Pacific coast of Mexico, at present without railroad connection, to a connection with the extension of the Sonora Railway, southeast of Guaymas.

An English syndicate, it is reported, is planning to build a line from San Jose del Sitio, Chihuahua, south to Parral and north to a point on the line of the Kansas City, Mexico & Orient.

MISSISSIPPI CENTRAL.—This company has extended its road from Silver Creek, Miss., west to Brookhaven, 29 miles.

MISSOURI, KANSAS & TEXAS.—A contract is reported let by this company for reducing the grades on the main line, on the section from Atoka, Ind. Ter., to the Red river.

NEVADA NORTHERN.—The line being built by this company from Cobre, Nev., south to the Ely mining region is nearing completion. According to the General Manager the road has been completed already into Cherry Creek, which is about 50 miles from Ely. (See Construction Record.)

NEW YORK & QUEENS COUNTY (ELECTRIC).—This company, which operates 40 miles of electric line in and near Long Island City, N. Y., is planning to build extensions to reach Bayside and Whitestone and eventually to Douglaston and Little Neck.

NORTHERN PACIFIC.—On the Pacific division of this road the Grays Harbor branch has been extended from Hoquiam, Wash., west to Moclips on the Pacific coast, 28 miles.

PALMA, SUANA & WESTERN.—This company has been organized at Portland, Me., for the purpose of operating railroads. Capital stock, $300,000. President, H. L. Cram; Treasurer, C. E. McGlauflin, both of Portland.

PAN-AMERICAN.—The road of this company beginning at San Geronimo, on the Tehuantepec National, is in operation southeast to Pipifiapam, 172 miles, with a branch from the main line at Tonala to Arista, 12 miles; and it is expected that the road as far as the border of Guatemala will be completed by the close of this year. Reports from Salvador indicate that a concession will soon be granted to the company, and that a subsidy will be allowed for the extension of the line through that country as soon as the present disturbance in Guatemala is settled. (See Construction Record.)

PEARL RIVER.—The charter of this company has been filed in Mississippi. The company has completed organization and will have a capital stock of $1,000,000. The following officers have been elected: President, Fred Herrick; Vice-President, C. F. Lattimer; Secretary, Arthur L. Hogue; Treasurer, Roy L. Hogue. (See Construction Record.)

PHILADELPHIA & READING.—The double track from Harrisburg to Shippensburg on the Philadelphia, Harrisburg & Pittsburg branch will be finished next month.

PORTO RICO ROADS.—Petitions have been made for a franchise by parties interested in the Porto Rico American Tobacco Co. to build a line from San Juan to Caguas.

PUTNAM & WESTCHESTER TRACTION.—Incorporated in New York, with $75,000 capital, to build an electric line from Peekskill, Westchester County, to Oregon, Putnam County. J. S. Ladd and A. L. Erhardt, of Peekskill, and Walter Perry, of Putnam Valley, are directors.

SEABOARD AIR LINE.—According to Birmingham reports, this company has completed arrangements to enter the city of Anniston and the Anniston mineral district by building a branch from its main line at Jacksonville, Ala., about half way between Birmingham and Atlanta, south to Anniston, about 25 miles. The surveys have been completed but work has not been started pending the securing of certain franchises from the Anniston City Council which have just been granted. It is said to be the intention of the company to build south from Anniston to Talladega and eventually to Montgomery, the western terminus of its line from Savannah. It also contemplates the construction of a branch line north from its main line to the Gadsden mineral district.

SOUTHERN.—An officer sends us the following statement showing the number of miles of new track laid since January 1 on branches and extensions:

	Miles.	Miles.	Miles.
Double Tracking—			
From Danville to Pelham, N. C., main line	9.60	...	....
Completed in March.			
From Pomona to High Point, N. C., main line	12.80	...	....
Northbound track laid to June 30	7.05	...	....
Southbound track laid to June 30	8.22	...	....
Knoxville to Mascot, Tenn.:			
Main line, estimated distance	11.90	...	....
Eastbound track laid to June 30	3.73	...	....
Westbound track laid to June 30	1.40	...	....
Jefferson City to new line, Tennessee:			
Main line, estimated distance	10.30	...	....
Eastbound track laid to June 30	5.16	...	....
Mobile Junction cut-off between Mobile Junction and North Bessemer, Ala.:			
Length of main line	3.40	...	....
Completed in March.			
Spur track for Pratt Consolidated Coal Co, near Davis mines, Alabama:			
Length of main line	.70	...	....
Length of sidings	.73	...	....
Completed in May.			
Spur track for the Ware Shoals Mfg. Co., near Barmore, S. C	1.70	...	....
Length of siding	.17	...	....
Two-thirds completed to June 30.			
Spur track for Atlas Coal Co., near Okman, Ala.:			
Length of main lire	2.39	...	....
Length of sidings	.47	...	....
Completed in January.			
Extension to the South Knoxville, Tenn., spur, for J. M. Ross Marble Company:			
Length of main line spurs and sidings, estimated distance	3.14	...	....
Track laid to June 30	3.00	...	....
Extension of Littleton branch, near Flat Top, Ala.:			
Length of main line, estimated distance	5.00	...	....
Track laid to June 30	1.00	...	....
Extension of line from Vardamam, Miss., to Derma, Miss.:			
Length of main line, estimated distance	8.90	...	....
Track all laid, but not ballasted.			
Spur track for Obey River Coal Company, near Obey City, Tenn.:			
Length of main line	.75	...	....
Length of sidings	.40	...	....
Total	——	...	101.91 +
Completed in May.			
DELTA SOUTHERN.			
Elizabeth Branch:			
Length of main line	15.70	...	....
Completed in May.			
Percy Branch:			
Length of main line, estimated distance	10.50	...	....
Length of sidings	1.00	...	....
Track laid to June 30	10.30	...	....
Itta Bena Branch:			
Length of main line, estimated distance	19.10	...	....
Length of sidings, estimated distance	2.00	...	....
Track laid to June 30	5.00	...	....
Spur track for S. J. Hughes on Elizabeth Branch:			
Length	.50	...	....
Completed in April.			
Total	——	...	64.10

CUMBERLAND.

In Tennessee.					
Campbell County, ft	...	18,094	3.05	...	....
Claiborne County—					
Main track, ft	...	32,070	6.07	...	....
Buffalo siding, ft	971	....	...	...	....
Clarfield siding, ft	860	....	.35	...	....
	——	1,831	——	9.47	....
In Kentucky.					
Bell County—					
Main track, ft	...	9,099	1.72	...	....
Pruden Station siding, ft	2,103	....	...	...	....
Sowder Creek spur "Y," ft	3,506	....	1.06	...	....
	——	5,609	——	2.78	
Total	...	....	...	——	12.25

ENSLEY SOUTHERN.

Spur track for Tutwiler Coal & Coke Company, near Short Creek, Ala.—			
Length of main line:	.80	...	....
Length of sidings	.88	...	....
Completed in May, 1906.			
Total	——	...	1.68
Total of all lines			179.94

The company has also a number of other lines under construction, on some of which a small amount of track has been laid, but not ballasted, and it will be some time before they are ready for operation. These are not included in the above table.

SHARON & SOUTH SHARON (ELECTRIC).—This company has secured a charter in Pennsylvania to extend its line to Wheatland. The incorporators are: C. Beckman, of Sharon; W. T. Burns, New Castle; R. Montgomery, Youngstown, Ohio, and others.

SOUTHERN PACIFIC.—It is said that this company is planning to build a line from Durango, Colo., and Silverton to Denver. Southern Pacific interests have already bought 1,000 acres of coal lands in and around Durango, on the border line between Colorado and New Mexico. Articles of incorporation have been filed in Colorado showing the route of the railroad. It lies through a rich coal territory.

TEXAS & PACIFIC.—The Avoyelles division of this road has been extended from Simmesport, La., south to Melville, 22.4 miles.

THOMASVILLE, SPARKS & NORTHEASTERN.—Incorporated in Georgia to build a line from Thomasville to the Gulf of Mexico.

THORNTON & ALEXANDRIA.—This company has extended its road from Calhoun, Ark., south to Hampton, 3 miles.

TOPEKA & NORTHWESTERN.—See Union Pacific.

TUSCARORA TRACTION COMPANY.—Incorporated in New York, with $500,000 capital, to build an electric line from Addison, in Steuben County, N. Y., west to Jasper, about 15 miles. Thomas E. Hardin, of Addison; George R. Brown and John M. Connelly, are directors.

UNION PACIFIC.—A contract has been given to Kilpatrick Bros., of Beatrice, Neb., for extending the Topeka & Northwestern from Onaga, Kan., northwest to a connection with the U. P. at Marysville, about 35 miles. This connecting line has already been built from Topeka on the Kansas City main line northwest to Onaga, 40 miles, where connection is made with the Leavenworth, Kansas & Western. (See Construction Record.)

VALDOSTA, MOULTRIE & NORTHWESTERN.—Incorporated in Georgia with $200,000 capital to build a line from Valdosta, Ga., on the Atlantic Coast Line, Georgia Southern & Florida and Valdosta Southern, northwest to Moultrie, on the Atlanta, Birmingham & Atlantic and the Georgia Northern, about 38 miles. E. P. Rose, C. R. Ashley, H. C. Briggs, J. A. Dasher, R. F. Ousley, J. Y. Blitch and D. C. Ashley, all of Valdosta, are interested.

WABASH.—This company has begun to operate the Cross Creek Railroad, a 6-mile coal line built by the Washington County Coal Co., from Avella, Pa., on the Wabash-Pittsburg Terminal.

WHEELING & LAKE ERIE.—This company, it is said, is planning to extend its Chagrin Falls branch north about 30 miles to Fairport, on Lake Erie. Surveys are now being made. It is thought the proposed extension will follow the original survey of the Clinton Air Line to within 10 miles of Painesville and then branch off to Fairport. The Clinton Air Line was surveyed and two miles of grading completed about 30 years ago.

WYOMING & NORTH-WESTERN.—See Chicago & North-Western.

YAZOO & MISSISSIPPI VALLEY.—A new line of this company, to be called the Silver Creek district, on the Vicksburg division, has been opened for business from Silver City, Miss., south to Holly Bluff, 24.7 miles.

YOUNGSTOWN & OHIO RIVER (ELECTRIC).—This company, which proposes to build a line from Salem, Ohio, east via Washingtonville, thence southeast via Leetonia, Lisbon and West Point, to East Liverpool, 34 miles, is asking bids for building the section from Washingtonville southeast to West Point, approximately, 15 miles. (June 8, page 168.)

RAILROAD CORPORATION NEWS.

ATLANTIC COAST LINE.—This company has bought the Macon, Dublin & Savannah, which runs from Macon, Ga., to Vidalia, 92 miles. The A. C. L., when a connection is built with this smaller line, will have a shorter route from Macon to Savannah than the existing line of the Central of Georgia.

BALTIMORE & OHIO.—The gross earnings of this company for the year ending June 30, 1906, were $77,392,056, an increase of $9,702,059. The net earnings were $27,876,835, an increase of $4,897,442. The company has for some time been carrying an unusually large amount of coal and it has also participated in the heavy traffic which all the trunk lines have been taking.

FOREST CITY RAILWAY, CLEVELAND.—This company, which is building 13½ miles of double-track road in and near Cleveland and has $2,000,000 authorized capital stock is offering $400,000 common stock at 90. When the road is completed it will be operated under lease by the Municipal Traction Co.

HARTFORD & SPRINGFIELD STREET RAILWAY.—The shareholders have authorized an increase of 850 shares of 6 per cent. preferred stock, making the total amount $285,000.

ILLINOIS CENTRAL.—A regular semi-annual dividend of 3½ per cent. has been declared on the $95,040,000 common stock. The semi-annual rate has been, heretofore, 3 per cent. and ½ of 1 per cent. extra.

KANSAS CITY, MEXICO & ORIENT.—There are now 1,619 miles of this road in operation and the Vice-President is quoted as saying that 1,100 miles will be completed soon after Jan. 1, 1907. About 325 miles of the 635 to be built in Mexico are already completed.

KANSAS CITY TERMINAL.—Under this name a company has been incorporated with $30,000,000 capital stock to build and operate new terminal facilities to take the place of the present Union Depot Co. A union passenger station will be erected at a cost of $3,500,000. Of the bonds to be authorized, $13,000,000 will be used to pay for land and terminal facilities, and $4,000,000 to buy the Kansas City Belt and to retire the outstanding bonds of the last named company. The incorporators are officers of the railroads entering the city.

LEHIGH VALLEY.—This company has opened a new freight terminal on the east side of the Harlem river, New York City, at the foot of East 149th street.

MACON, DUBLIN & GEORGIA.—See Atlantic Coast Line.

MEDIA, MIDDLETON, ASTON & CHESTER (ELECTRIC).—See Philadelphia Rapid Transit.

MOHAWK VALLEY (N. Y. C. & H. R. ELECTRIC LINES).—This company has filed a certificate of an increase in capital stock from $10,000,000 to $20,000,000. Half of the total amount has been issued and the certificate filed shows that the New York Central & Hudson River holds $6,000,000 of this amount and that Horace E. Andrews holds the remaining $4,000,000.

NATIONAL OF MEXICO.—A dividend of 1 per cent. on the $32,000,000 4 per cent. first preferred stock of this company has been declared. This is the first dividend on this stock and, while it is not announced that the payment will be continued, it is believed that the earnings of the company will continue to warrant it. During the last few months the earnings have increased at a rate greater than 10 per cent.

NEW YORK, NEW HAVEN & HARTFORD.—This company, through the New England Navigation Company, has taken over the property of the Block Island & Providence Co., which operates a steamship line between Rhode Island and Block Island.

NEW YORK, WESTCHESTER & BOSTON (ELECTRIC).—This company, which has begun to build its road from New York City eastward to the Connecticut state line, has been refused a franchise in the town of New Rochelle, N. Y. It is reported that it will be two years before a decision can be obtained from the Court of Appeals on this matter.

NORFOLK & WESTERN.—Brown Brothers & Co., New York, are offering at a price to yield about 4¾ per cent. the unsold balance of an issue of $4,000,000 4 per cent. equipment trust notes. They are secured on 86 freight locomotives, 1,885 gondolas, and 1,000 box cars. (July 13, p. 12.)

PENNSYLVANIA.—It is announced that the French syndicate has sold, at 99, the entire amount of the 250,000,000 francs Pennsylvania Company 15 year, 3½ per cent. bonds. (June 22, p. 182.)

PHILADELPHIA, MORTON & SWARTHMORE (ELECTRIC).—See Philadelphia Rapid Transit.

PHILADELPHIA RAPID TRANSIT.—This company has leased the Philadelphia, Morton & Swarthmore and the Media, Middletown, Aston & Chester. The P., M. & S. runs from Swarthmore to Philadelphia, 15 miles, and the M., M., A. & C. runs from Chester to Media, five miles. The outstanding capital stock of the P., M. & S. is $250,000 and funded debt $500,000. The M., M., A. & C. has $205,300 outstanding capital stock and $210,000 bonds.

PITTSBURG.—It is reported that E. H. Gay & Co., of Boston, and Fisk & Robinson, New York, have completed the floating of a bond issue of $55,000,000 for the purpose of building a new union terminal at Pittsburg for the Erie, the Buffalo, Rochester & Pittsburg, the Pittsburg, Shawmut & Northern, the Buffalo & Susquehanna and the Pittsburg, Binghamton & Eastern.

SAN FRANCISCO, OAKLAND & SAN JOSE (ELECTRIC).—This company has 14 miles of road in Oakland, Cal., and also operates a ferry line across the bay to San Francisco. It proposes to build a pier at Oakland diagonally from the water front to the broad gage pier of the Southern Pacific, so as to enclose a triangular space which will be filled in and used as a freight yard. The slips will be built for the accommodation of ocean steamships and the company will transfer freight from these boats to other railroads.

SOUTHERN.—See Transylvania.

TRANSYLVANIA.—This company made a mortgage to the Standard Trust Company, New York, trustee, securing $500,000 first mortgage 5 per cent. bonds of 1956. The company's property is leased to the Southern and is operated as a part of the last named road's Carolina division. Of the authorized amount of bonds, $434,000 has been issued to retire underlying bonds and to discharge floating obligations. The remainder is reserved for betterments and additions.

VELASCO, BRAZOS & NORTHERN.—This road was sold under foreclosure on July 3 to H. C. Alexander, Dallas, Tex., for a price said to be $260,000.

WABASH.—It is reported that the French firm of Dupont & Furland are offering in France $6,250,000 4½ per cent. equipment bonds. The Wabash sold $6,900,000 of these bonds, in June, to Lee, Higginson & Co., of Boston, who offered for sale, in this country, $6,180,000 of them.